ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 7.] [1908.

XXXVII.—"DIE-BACK" OF PEACH SHOOTS.

G. MASSEE.

About 58,000 species of fungi have been described, and of this number at least 10,000 are placed by mycologists under the heading "Fungi imperfecti," on the assumption that such are in reality nothing more than stages in the life-cycle of species of the higher fungi, belonging to the Phycomycetes, Ascomycetes, and Basidiomycetes respectively. This line of reasoning is supported by the fact that in many instances such relationship has, by means of pure cultures, been proved to exist. There remain, however, many thousands of these forms that have not yet been connected with any of the higher species, and as it is important both from a scientific and economic standpoint that such should be accurately described, they are grouped under "form-genera" and "form-species," thus implying that they are stages which have not as yet been connected with higher species.

Such form-species or conidial stages are unknown in connection with the primitive species of aquatic fungi, and were only evolved as supplementary stages when the fungi passed from their original aquatic habitat and established themselves on dry land. These conidial stages possess many features in common. They are all asexual in origin. The conidia are produced in immense numbers and in rapid succession throughout that portion of the season when the host of the fungus is in active growth. The conidia germinate at once when mature, and being dispersed wholesale by wind, birds, insects, &c., are constantly infecting new hosts. In fact, the special function of conidia is to extend the geographical area of the species, while the spores of the original or higher form of the species, which require a period of rest before they are capable of germinating, are only concerned with the survival of the species in time, by tiding it over that period when the host is not in a condition to furnish food for the fungus.

From the above account it will be seen that the conidial form of a fungus is invariably the cause of an epidemic or of a rapid spread of a disease, except in those instances where even this method has been superseded by the presence of hybernating mycelium in

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the host plant. Conidial forms as a rule are rampant parasites, whereas the primitive or sexual stage of the same fungus is usually a saprophyte, and only appears when the host is on the wane, if not quite dead.

The members of the *Peronosporeae* illustrate the gradual transition of a primitive group of fungi from an aquatic to an aerial habitat. The sexual and oldest stage of the fungus as yet retains so much of its original nature that the reproductive bodies take the form of zoospores, whose only mode of dissemination is by means of water, which obviously limits their dispersion on land. By the addition, however, of a conidial stage, whose reproductive bodies are dispersed by wind, animals, insects, &c., the various members of the *Peronosporeae* have been enabled to extend the area of their distribution to the utmost limits of range of the hosts to which they have become adapted.

The parasite which causes the disease about to be considered presumably belongs to the category of "form-species," but as yet there is no direct evidence on the point, since pure cultures of the conidia have hitherto failed to produce any other form of fruit. The fungus is called *Naemospora crocea*, Sacc., and belongs to the family *Melanconieae*, which is characterised more especially by the absence of a definite perithecium or fruit enclosing the reproductive bodies or conidia.

During the past few years numerous inquiries have been addressed to Kew respecting the disease, aptly termed by one correspondent as "die-back of two-year-old peach shoots."

In the spring the leaf-buds expand normally, without any suggestion of disease, but just about the time when the blossom is fully expanded the young leaves suddenly wilt, turn brown, and die within a few days. At the same time the petals change to a rusty brown colour and the flowers droop, but remain attached to the branch for some time, as also do the leaves. Finally the shoots bearing diseased leaves and flowers assume a deep claret-red colour, and shrivel more or less as the season advances.

The above are the distinctive and unvarying naked-eye characteristics of the disease under consideration. About midsummer, when the dead leaves and flowers have been removed by wind and rain, trees that have been badly diseased can be recognised by the presence of numerous naked shoots, varying from one to two feet in length. During the months of May and June of the following year these dead branches, if carefully examined, will be found to be more or less thickly studded with minute, dull-orange-coloured, tendril-like bodies, consisting of myriads of spores of a parasitic fungus.

If a section is taken through a branch at the point where such a tendril-like body is protruding, the fungus will be seen to consist of a more or less depressed sphere situated in the cortex. These spheres, which are quite numerous, consist at first of a minute, solid mass of mycelium, which gradually increases in size, becomes hollow, and is eventually lined with closely-packed, slender threads or sporophores, which originate from the cells forming the inside wall of the sphere, with their free tips projecting into the cavity of the fruiting body. The minute spores are

produced in rapid succession from the tips of the sporophores, and soon fill the cavity of the fruiting body, which now begins to indicate its position by a slight wart-like protuberance under the epidermis of the host plant. When the fruiting body of the fungus is replete with spores, the sporophores deliquesce and form a highly hygroscopic substance, which increases very considerably in volume when in contact with water. This peculiar property of the disintegrated sporophore-material enables the spores to escape from the fruiting body into the air.

When the spores are mature and the sporophores have deliquesced, the whole are extruded from the fruit through a rupture in the epidermis caused by the increasing pressure of the spore-mass. This extrusion takes the form of tendrils, consisting of myriads of spores immersed in mucilage, and takes place after a shower of rain, the water causing the mucilage to swell to a remarkable extent. At the moment of extrusion these tendril-like bodies are very soft and gelatinous, but they commence to dry and harden the moment they come into contact with the air, and in the act of drying usually become spirally coiled and variously contorted. The extrusion of the entire mass contained in a spore-cavity usually occupies about five minutes. In dry weather the tendrils are rigid and horny, but they become soft and glairy when moistened with rain or dew. These spore-masses are not dispersed by wind, but depend for their dissemination to a great extent on birds, who convey the spores when moist and gelatinous from diseased to healthy shoots by means of their feet.

The shoots are only capable of infection while quite young, but when the mycelium has gained an entrance into the tissues it spreads rapidly and infects the entire growth of the season. Four shoots infected respectively at one point only, when three inches long, and protected from the visits of birds by netting until the end of the year, were found the following year to be infected throughout their entire length—about 15 inches—and produced numerous tendril-like masses of spores. In another experiment a branch bearing six shoots was selected; three of the shoots were infected with spores, whilst the remaining three were left uninfected as controls. All these shoots were protected by netting, and the following year the three infected shoots were badly diseased, while the uninfected control shoots remained healthy. No success attended the many attempts to infect branches more than one year old, not even when spores were placed in a wound made in the cortex.

The spores do not retain their power of germination for more than about three months.

Description of the Figures.

1. A two-year-old shoot showing the first symptoms of disease. Nat. size.
2. A dead shoot showing the tendrils of spores. Nat. size.
3. Section of cortex of a diseased shoot, showing spore-conceptacles and tendrils of spores. Slightly mag.
4. Portion of a tendril showing the spores imbedded in mucus. Mag.
5. Spores, some germinating. Highly mag.

XXXVIII.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW: VIII.

I.—MACRO-LEPIDOPTERA (with Tortricina).

A. Langley Simmons.

The collection of insects belonging to this order progressed steadily during the past year, but the climatic conditions which generally prevailed were anything but favourable to good work. There has not been a season for a great number of years which has been so wholly disappointing, and this scarcity of insects was apparent throughout Great Britain. It is difficult to find a reason for this, even allowing for cold winds in the early summer, and retarded vegetation. The autumn species, especially the *Noctuidae*, were singularly scarce, and all the ordinary baits generally used for their capture were ineffective. Much work has to be done yet to discover the causes which make insects plentiful in one year and scarce in another; it is a subject of which really little is known.

In spite of the conditions referred to, however, the records made are extremely interesting, and in the case of *Deilephila euphorbiae*, probably unique. With the two previously published lists, the record is becoming a valuable one, and it is not yet by any means exhausted. The whole of the following records were made between February and November, 1907.

RHOPALOCERA.

Papilionidae.

Papilio machaon, *L.*—"The swallow-tail butterfly."

One specimen was taken on the wing in the Palace grounds, by H. J. Burgess. As this butterfly is now only found in the fens of Norfolk, Cambridge, and Hunts., it is probable that the one captured had been allowed to escape by a collector who had been breeding them. They are found all over the world, except Australasia, four species existing in Europe. The larvae feed on *Peucedanum*, *Heracleum*, *Angelica*, &c.

HETEROCERA.

NOTODONTINA.

Sphingidae.

Sphinx pinastri, *L.*—"The Pine Hawk moth."

One pupa was found under a Scotch Pine (*Pinus sylvestris*) in February, by Reginald A. Simmons. It remained very lively for some months in confinement, but failed to emerge. The pupa was opened and examined by Mr. W. J. Lucas, and proved to be undoubtedly *S. pinastri*. The discovery of this insect at Kew is

of course interesting, as it is regarded as a scarce casual only. It is, however, believed to have established itself in a small locality in Suffolk and in Kent. It is general in Northern Europe and North America, on *Picea excelsa* and *Pinus sylvestris*. At times the larvae cause immense destruction to these trees on the Continent and in North America.

Deilephila euphorbiae, *L.*—"Spurge Hawk moth."

The finding of two pupae by Mr. G. Nicholson and the writer in March of last year is probably the most interesting discovery yet made among the lepidoptera existing in the Gardens. This beautiful moth is extremely rare in Great Britain, being a very occasional immigrant only. The pupae were found under an oak tree in the quietest spot in Q.C., quite close to the surface, about nine inches from the trunk, facing N.E., and were in earth cocoons. The imagines put in an appearance in June, one proving to be a beautiful variety. Dr. Chapman states that on the Continent they are subject to great variation in their markings. The food plants are generally given as *Euphorbia Paralias* and *E. Cyparissias*, but as neither of these plants is found within half a mile of where the pupae were dug, it is only fair to assume the larvae existed on some other plant not yet noticed. The moth has a wide distribution abroad, being found in C. and E. Europe, N. Africa and Asia, to the Himalayas. The two moths under notice were recorded in the *Entomologist* for August, 1907.

D. porcellus, *L.*—"Small Elephant Hawk moth."

One specimen captured by Stanley Goodwin as late as the end of August, outside the Garden walls. Fairly well distributed throughout Great Britain, Europe, and Central Asia. On Bedstraws.

TRIFIDAE.

NOCTUIDAE.

Leucania straminea, *Tr.*—"The streaked wainscot."

One specimen taken by the lake. Found in the Southern and Eastern English counties, and N. and C. Europe. Not common. On *Phragmites*.

Hadena pisi, *L.*—"Broom moth."

Common throughout Great Britain and N. Europe. On *Pteris*, *Cytisus*, *Scabiosa*.

H. genistae, *Bkh.*—"The light brocade."

Common in England, local in Scotland and Ireland; C. Europe and N. Asia. On *Genistae*, *Polygonum*, *Stellaria*.

Apamea fibrosa, *Hb.* (*leucostigma*, Hb.).—"The crescent rustic."

Two specimens taken in Kew. Found locally all over Great Britain; C. Europe and N. Asia. Larvae feed in the flower stems of yellow flag.

Agrotis cinerea, *Hb.*—"The light feathered rustic."

Found generally throughout England and Scotland, not Ireland; C. and N.W. Europe and Asia Minor. On *Thymus*, *Rumex*, &c.

Noctua baja, *F.*—"Dotted clay."

Taken at treacle. A common moth found throughout Great Britain; Europe, Asia, and N. America. On *Salix* and *Primula*.

Toeniocampa instabilis, *Esp.* (*incerta*, Hufn.).—"The clouded drab."

One of our commonest moths, found all over Great Britain; N. Europe and N. Asia. On oak, poplar, hawthorn, willow, &c.

GEOMETRIDAE.

Boarmidae.

Already recorded in *Kew Bull. Add. Series* V., 1906, p. 40 (under *Biston hirtaria* L.).

Biston hirtaria, *Cl.*—"Brindled Beauty."

One specimen taken. Not a common insect. Found in the Southern and Midland counties of England and in N. and C. Europe. It is believed that with this species the male is sought by the female, contrary to the usual rule. On oak, elm, ash, lime, and fruit trees.

Hybernia defoliaria, *L.*

A common insect found all over Great Britain, N. Europe and N. Asia. The female is apterous. On oak, beech, hawthorn, &c.

Lasiocampidae.

Bombyx neustria, *L.*—"The lackey moth."

Confined to England, S. and M. counties; Europe and N.W. Asia. On hawthorn, blackthorn, and fruit trees. At times a pest in the orchards, but not so plentiful as formerly.

Bupalus pinaria, *L.*—"The bordered white."

One specimen, taken by Mr. G. Massee. Common in Great Britain wherever pine woods exist; also in N. Europe and N.E. Asia. On *Pinus sylvestris* and larch.

Pericallia syringaria, *L.*—"Lilac beauty."

Common to England only, Europe and N. Asia. On *Ligustrum* and *Lonicera*.

Ennomos angularia, *Bkh.* (*quercinaria*, Hufn.).—"The August thorn."

A batch of ova taken by Mr. Sich in Palace grounds. They fed up, pupated, and emerged in July. Some of the moths were extremely dark, being deeply strigulated with dark fuscous. Common in England, scarce in Scotland, not found in Ireland; also in C. Europe. On birch, beech, oak, and ash.

Panagra petraria, *Hb.*—"Brown silver lines."

Common to Great Britain wherever bracken abounds; C. Europe and across Asia to Japan. On *Pteris aquilina*.

Scotosia certata, *Hb.*—"The tissue."

Taken by Mr. T. Nicholson. Common in the S. and M. Counties of England; C. Europe and W.C. Asia, Persia, and Japan. On *Berberis*.

PYRALIDINA.

SCOPARIIDAE.

Scoparia crataegella, *Hb.*

A common little moth found throughout Great Britain and C. Europe. On mosses.

SESIA.

Trochilium tipuliformis, *L.*—"The currant clear-wing."

Although diligently searched for, this and the following species are the only clear-wings yet observed in the Gardens. Mr. G. Massee took the specimen in Q. All the species are diurnal, with a rapid flight. The wings are only partially covered with scales. *T. tipuliformis* is the commonest member of the family, and feeds on branches and twigs of currant, particularly *Ribes nigrum*. It is found in England and Scotland, and is practically cosmopolitan, having been introduced artificially to Australasia.

T. myopaeformis, *Bkh.*—"Apple clear-wing."

Several empty pupa-cases found protruding from the bark of apple trees by Mr. G. Nicholson and Mr. Sich in P., in August.

TORTRICINA.

EPIBLEMIDAE.

Eucosma betuletana, *Hw.*—"The birch tortrix."

Common throughout Great Britain and Europe. On birch.

E. bifasciana, *Hw.*

One taken in A. A local species in England.

E. striana, *Schiff.*

Generally throughout Great Britain and Europe. In roots of *Taraxacum*.

Hedya lariciana, *Zell.*

One bred from larch. This species is considered by some to be a form of *H. ocellana*, Fab., already recorded.

Ancylis lundana, *F.*

An extremely common little moth. Found all over Great Britain and the N. Hemisphere. On *Vicia*, *Lathyrus*, &c.

Coccyx tedella, *Cl.*—"Pine silver-barred tortrix."

Very common throughout Great Britain and Europe. On *Picea excelsa*.

Epiblema solandriana, *L.*

Common to Great Britain and N. and C. Europe. On hazel, birch, and *Salix caprea*.

E. bilunana, *Hw.*

On birch in A. Common in Britain and C. Europe.

Pammene regiana, *Z.*—"Yellow blotch back."

Common in the S. of England and E. Ireland; C. Europe and Asia Minor. Larva feeds beneath the bark of sycamore.

Hemimene petiverella, *L.*

A very common species, attached to *Tanacetum*.

H. simpliciana, *Hw.* (*caliginosana*, Tr.).—"Plain silver-fringed tortrix."

S. and M. Counties of England and Ireland. Not common. Also in Holland and Germany. In rootstocks of *Artemisia vulgaris*.

TORTRICIDAE.

Acalla aspersana, *Hb.*—"The red rough-wing tortrix."

Locally plentiful. Great Britain and C. Europe. On *Spiraea*, *Poterium*, &c.

Teras caudana, *F.*—"The notch-wing tortrix."

Common to Great Britain, Europe, and N. America. On *Salix*.

Dichelia grotiana, *F.*—"The groatian tortrix."

Local in the S. and M. English Counties, also C. Europe. Food plant unknown.

Cacoecia lecheana, *L.*

One bred from larch. A common species attached to various trees.

Retina buoliana (*Schiff*) was recorded in the last list, but it is mentioned again in this to draw attention to the damage done to pine trees in the early summer by these destructive larvae. The ends of the branches and shoots were buttoned and aborted, greatly disfiguring the trees, and the larvae seemed to be more than commonly plentiful.

II.—MICRO-LEPIDOPTERA.

ALFRED SICH.

The summer of 1907 was too damp and cold to be very favourable to the Micro-Lepidoptera; but, as regards the Tineina, a very fair number of additions were made. Some of these have already been published in the *Kew Bulletin* (No. 5, 1907), and it now remains to record those additional species which have been observed since that publication was issued. Although *Tinea cloacella* has already been recorded as an inhabitant of the Gardens, it may be of interest to note that no less than fifteen of these prettily mottled insects were found by Mr. G. Nicholson and

myself at rest on an old Lime tree in the Palace Grounds on June 12 last. *Fomes fomentarius*, Fries, was growing from the tree, and this fungus had evidently served as food for the tineid larvae, as a pupa case was found protruding from the upper surface of the fungus.

Cemiostoma (*Leucoptera*) *spartifoliella* was in great abundance, and Mr. G. Nicholson is of opinion that, small as the insect is, it must certainly be considered destructive. The larvae which feed from September to May, eat out serpentine galleries beneath the bark of the Broom (*Cytisus scoparius*). When full fed, they bore through the bark, and then spin a thick white silken cocoon on the outside of the bark. During this period of their lives, they are therefore well protected, and it is difficult to devise means for their destruction. Possibly spraying the Broom bushes with some noxious compound, such as soft soap with paraffin, several times during the period when the moths are on the wing in June and July, might serve to decrease their numbers. In May and June the conspicuous white cocoons might be scraped off the bark and destroyed, but this process would be very tedious.

On the 15th of April Mr. Nicholson handed me two larvae of a Tortricid moth (probably those of *Capua angustiorana*). Adhering to each was an Hymenopterous parasitic larva. These parasites continued their existence, lying on the backs of their hosts, and when full fed, left the shrivelled skins of their victims and spun slight cocoons. When the winged insects appeared, they were sent to Mr. Claude Morley, who kindly identified them as a pair of *Oedematopsis scabriculus*, Grav., adding that the attacks of this species appear to be confined to the *Tortricidae*.

The larvae of Lepidoptera are frequently attacked by Hymenopterous and Dipterous parasites, but in most cases these remain hidden in the bodies of their hosts until full fed.

TINEINA.

YPONOMEUTIDAE.

Swammerdamia caesiella, *Hüb.*

One taken by Mr. A. L. Simmons.

S. pyrella, *Vill.*

This pretty little species is common about the hawthorn in Q., in spring, and is also not rare on the stems of apple trees in P.

Argyresthia glaucinella, *Zell.*

One taken by Mr. A. L. Simmons. This is a local insect. The larva is said to feed in the bark of oaks and chestnuts.

A. semitestacella, *Curt.*

One specimen. This is attached to the beech, and is doubtless common in A.

A. retinella, *Zell.*

Not rare in Q. among the birches, in the shoots of which the larva feeds.

A. cornella, *F.*

Common on stems of apple in P.

A. goedartella, *L.*

Occurs in A. It is probably common on most of the birch trees in the Gardens. The larvae live in the catkins in spring, and by their burrowings cause the catkins to bend and twist. If a twisted catkin be carefully opened, the larva may be found inside. They leave the burrow to pupate. The moth is beautiful, being white with golden-red bars, or sometimes entirely golden.

A. brockeella, *Hüb.*

Occurs with the preceding species in A., but is not quite so abundant.

Cedestis farinatella, *Dup.*

Two specimens from *Pinus Laricio*, in A. Its usual food is *Pinus sylvestris*, in the needles of which the larva mines.

PLUTELLIDAE.

Cerostoma vittella, *L.*

Mr. Nicholson found one specimen on a lime in P. It is doubtless common on the elms in the gardens.

GELECHIADAE.

Bryotropha terrella, *Hb.*

Not rare in Q. Generally very common in meadows in June and July. Variable in ground-colour.

Gelechia pinguinella, *Tr.*

Local. Taken by Mr. A. L. Simmons. Occurs sometimes in numbers on bark of *Populus nigra*.

G. rhombella, *Schiff.*

Found by Mr. Nicholson on bark of apple trees in P. It has the habit of hiding itself under the flakes of the bark, and from its dull colour is easily overlooked.

G. mulinella, *Zell.*

Common in A. Common among *Ulex* and *Cytisus*. The larva feeds in the flowers of these plants.

Lita costella, *Westw.*

Taken by Mr. A. L. Simmons. The larva is attached to *Solanum Dulcamara*, and is equally at home, whether mining in the leaves or stem, or living between the young leaves spun together, or even in the berries.

L. maculiferella, *Dgl.*

Not rare in the Gardens. This is a local species, but has for many years been taken in the London district.

Aristotelia ericinella, *Dup.*

On *Calluna* in A. This beautiful species must not be confounded with *Gelechia ericetella*, Hüb., previously recorded. It is generally common on heaths in August.

Oecophoridae.

Depressaria costosa, *Haw.*

On *Ulex* in A. Common in most places where its food-plants grow (*Ulex*, *Cytisus*).

Borkhausenia augustella, *Hüb.*

Two specimens taken in Q. It is somewhat local, but quite a Londoner, as it has been taken in Hyde Park.

B. lunaris, *Haw.*

A handsome little insect. Taken in P. The larva lives probably in decaying wood.

Elachistidae.

Batrachedra praeangusta, *Haw.*

In A. This is a singular insect, the forewings being very elongate. It sits on the bark of poplar trees with its head raised, thus bearing a somewhat fanciful resemblance to a frog.

Blastodacna hellerella, *Dup.*

A typical specimen was taken by Mr. Nicholson near hawthorn, in Q., in July, where it probably is not rare. Another very dark specimen was captured on an apple trunk, near a hawthorn hedge in P., in August. This dark specimen certainly approaches *B. vinolentella*, H.-S., but does not quite agree with the description of that species, and may therefore rather be considered as another of those dark forms of Lepidoptera which occur in the London District.

Mompha stephensi, *Stn.*

This is usually considered a local species, and is mostly taken on the trunks of trees. Three specimens, one on an alder near the lake.

Heliozela stanneella, *F. R.*

This minute species sometimes flies in little swarms in the sunshine. Mr. Nicholson discovered a swarm hovering over the twigs of a yew in the Gardens last May. There was an oak close by which had doubtless served the larvae as food.

Coleophora juncicolella, *Stn.*

This is probably quite common on the ling in the Gardens, as it was readily obtained each time it was sought. The larval case is minute, and so exactly like a terminal bud of the ling that it can scarcely be detected unless the larva be in motion. It may be obtained by shaking the ling over an inverted umbrella and patiently watching till the larvae crawl out of the débris. On one occasion while thus employed Mr. Nicholson detected a scale, new to the Gardens.

C. badiipennella, *Dup.*

Much more common than the following species, on elm. The first larva noticed was on Queen Elizabeth's elm.

C. limosipennella, *Dup.*

Does not appear common in the Gardens. A few cases taken off elm in P.

C. gryphipennella, *Bouché.*

This is rather common on various roses in the Gardens. The larva makes whitish blotches in the rose leaves, but as it prefers the more hidden parts of the bushes the blotches are not so conspicuous as they might otherwise be.

C. bicolorella, *Stn.*

Common in the Gardens on several trees, among others on *Alnus firma*, and Mr. Nicholson found it on purple hazel. The larva hybernates in a small brown case, but in the spring it adds a larger piece of green leaf, making thus a case of two colours, hence the specific name.

C. paripennella, *Zell.*

Cases containing young larvae were taken in A. off *Corylus Colurna*. It feeds on many shrubs and trees, *Rosa*, *Rubus*, *Prunus*, &c. When the larva is young it attaches leaf fragments to the mouth of the case, which then presents a frilled appearance.

C. albitarsella, *Zell.*

This species does not appear common in the Gardens. Mr. Nicholson and myself made search for the larva on several occasions before we succeeded in finding it. One of its favourite haunts is on the underside of the leaves of *Nepeta Glechoma*, where that plant grows among nettles at the foot of a hedge. It occurs in P.

C. ibipennella, *Zell.*

Not rare in the Gardens on birch. The larva lives in a case spun entirely of silk and shaped somewhat like a minute black pistol. It is still undetermined whether this species, known in England as *ibipennella*, is really Zeller's species of that name.

C. murinipennella, *Dup.*

This is abundant in May in Q. On the 10th of May, 1907, the grey moths were fully on the wing, especially where the food-plant, *Luzula campestris*, was conspicuous among the herbage.

Elachista apicipunctella, *Stn.*

One taken in P.

E. albifrontella, *Hüb.*

Taken among grass in Q.

E. nigrella, *Haw.*

Not rare among grass in Q. The imagines of this genus are fairly numerous in individuals, but from their retired habits are easily overlooked. The larvae are miners in the leaves of grass and sedge.

GRACILARIIDAE.

Gracilaria alchimiella, *Sc.* (*swederella*, Thnbg.).

This pale purple and yellow insect occurs among oaks in the Gardens. Its habit of sitting with its head much raised, gives it a striking appearance when at rest.

G. stigmatella, *F.*

Only one imago has yet been captured, but the "cones" of the larvae were frequently noticed in A. and P. on poplar and willow last autumn. The larva twists a portion of the leaf into a cone-shaped domicile, and feeds in the interior. The imago hybernates, and may be met with in the spring.

Ornix betulae, *Stn.*

Not rare on the birches in A. The larva lives within a domicile made by folding over a portion of the leaf.

Lithocolletis hortella, *F.*

One taken by Mr. A. L. Simmons. This is a local species, and appears to be rare in this district.

L. alniella, *Zell.*

In the alder plantation near the lake.

L. ulmifoliella, *Hüb.*

Among the birches in May. It appears to have nothing to do with elms. The larva lives in a mine on the underside of birch leaves.

L. viminiella, *Stn.*

One specimen bred from mines on the underside of the leaves of *Salix caprea.*

L. comparella, *Zell.*

Common in the gardens at rest on the bark of poplars. The larva makes mines on the underside of the leaves of *Populus alba*, *P. nigra*, and var. *pyramidalis.*

Tischeria marginea, *Haw.*

Common among brambles in Q. The larva makes whitish cornucopia-shaped mines in leaves of bramble.

Lyonetia clerkella, *L.*

Occurs in P. It is an interesting little moth. The larva makes bold galleries in the leaves of apple, cherry, &c. When full fed it leaves the mine and spins two silken strands along a leaf, which cause it to buckle. On these strands it then forms a cocoon which hangs like a hammock between them. Here the pupa rests till the little white moth comes forth.

Phyllocnistis suffusella, *Zell.*

The mines of this species are common on the leaves of poplar in the Gardens. The larva is very peculiar in appearance and habits. It has no legs but a long forked tail, quite unlike a lepidopterous larva, and lives only on the juice of the leaf. When

full fed it casts its skin and assumes a shape much more like an ordinary caterpillar, and without further feeding it at once spins its cocoon. The leaves mined by this species appear as though a snail had crawled over them and left a slimy track. Goeze observed this as long ago as 1774. The larva in the mine may easily be observed with the aid of a lens.

Cemiostoma (Leucoptera) laburnella, *Stn.*

Taken by Mr. Nicholson in Q. The larvae make blotches in the leaves of laburnum.

Bucculatrix cristatella, *Zell.*

Common among yarrow in Q.

Opostega salaciella, *Tr.*

Occurs in Q. Its larval habits are still unknown. The white moth is peculiar in having the bases of the antennae enlarged into eyecaps, which completely cover the eyes when the moth is at rest.

Trifurcula immundella, *Zell.*

Not rare among *Cytisus scoparius.* Its habits are somewhat similar to those of the above mentioned *Cemiostoma spartifoliella*, and it shares probably with that species in the destruction of the broom.

Nepticula marginicolella, *Stn.*

Occurs in P. The larva mines usually close to the margin of the leaf of elm, sometimes so closely that the mine follows the serration of the leaf.

N. plagicolella, *Stn.*

Also occurs in P. The larva commences its mine by making a fine gallery in the leaf of blackthorn or (as in the Gardens) of the domestic plum. At the end of the gallery it makes a large pale blotch.

N. basalella, *H.-S.*

The larva of this species mines in beech leaves. It occurs in A.

N. trimaculella, *Haw.*

Common in A. The minute moth may be found on the bark of poplars, and the larva in galleries between the cuticles of the leaves.

N. subbimaculella, *Haw.*

The larva mines in oak leaves, and the moths may often be seen resting on the bark in numbers. Mr. G. Nicholson sent specimens from the oak trunks in Q., and aptly wrote that the moths were there " in orderly crowds."

Narycia monilifera, *Geoffr.* (*melanella*, Haw.).

One specimen off the bark of an oak. The larva lives in a case which it carries about with it, and feeds on lichen and other vegetable growths which occur on bark.

Eriocrania subpurpurella, *Haw.*

Mr. Nicholson took two of these beautiful pale golden insects in the Gardens last May. The larva makes large mines in oak leaves.

Micropteryx seppella, *F.*

One specimen in Q. The larvae of this genus, of which those of two species are known, are of very peculiar construction. They have ten rows of ball-like appendages along the body, and eight pairs of prolegs and a terminal sucker. They feed on wet moss (*Hypnum*). Our knowledge of these singular caterpillars is due to Dr. T. A. Chapman.

XXXIX.—CULTIVATION OF THE DATE PALM IN MESOPOTAMIA.

The following article on the cultivation of the Date Palm in Mesopotamia by His Majesty's Consul at Basra, Turkey in Asia, has been received at Kew, through the courtesy of the Secretary of State for Foreign Affairs :—

"Trees can be reared from seed, but do not bear good fruit. Offshoots are preferred. The shoots are cut from the stump of the male or female tree as required, and are transplanted. The larger they are the better, as there is less chance of their being injured in transplanting. They are very hardy, and the average weight of an offshoot is about 12 lbs. If planted near the river they get sufficient water with the rise of the tide. The date gardens are intersected by irrigation trenches leading to the creeks. These fill naturally with water as the tide rises. If the land is far from the river and unaffected by the tide, the offshoots will need hand-watering for about six months. The spot must be sunny, as plants develop very slowly in the shade. Offshoots can be planted all the year round, except during 60 days in the winter and during the dog days in August. This hot period is called Bahura, and lasts seven days. The shoots are placed about 10 to 15 feet apart. They need not be planted immediately they are cut, but can be preserved for about three weeks by placing the roots in water. When planted they are wrapped up in bulrushes (Berdi) or in palm leaves (Saf) to protect them from extreme heat and cold. The soil should be soft, low enough to be affected by the tide, and all stones removed.

"Where water is plentiful and soil good, the offshoots take root and develop rapidly, bearing fruit within four or five years from the time of planting; Khadrawee bear fruit under these conditions in three years; Hallawee and Sayer in four or five years. Where water is scarce and the ground hard, seven to eight years elapse before signs of fruit are visible. Shoots are placed in a hole dug in the earth, and are surrounded by soft soil. No manure is required. Trees are manured after the third year, and cow dung is used for the purpose. The palm tree begins to bloom towards the end of February, if the weather is mild. A fleshy

spike, enclosed in a leaf or spathe (Tilla'), sprouts round the heart of the tree in a strong cover (Girif), like a sword scabbard. The sheath (Girif) splits in March, and shows a bunch of blossom, milky white in colour. If the sheath in the female tree does not burst by the end of March, it is opened artificially. On the female palm (Nakhla), the spathe (Tilla') contains the flower ('Ilib) and the stalk (Esga), enclosed in a sheath (Girif). On the male palm (Fahl), the spathe contains the twig for fertilising (Ligah), on which is the pollen (Tahin), the whole being enclosed, as on the female tree, in a sheath.

"It is usual to open the sheath in the male tree artificially, as, when left to itself, the pollen is scattered by the wind immediately it opens. The male blossom is bigger and broader than the female. The male trunk is also bigger and stouter. Its branches and prickles are stronger. The root of the branch (Karab) where it joins the trunk (Jida') is coarser than the female. The male blossom appears about a month before the female. Both are milky white.

"The branch of the date palm is called Saf, the lower part of it Gasmul, the middle part Jerida, and the leaves Birdel or Khoos; the prickles on the lower part are called Shok. The fibre of the date palm is called Lif.

"When the scabbard splits in March and the blossom appears, the female palm is fertilised. This is done by impregnating the female blossom with a portion of the blossom of the male tree. The cultivator climbs the tree, opens the bunch of female blossom slightly and deposits in it a few sprigs of the male blossom. A special kind of male palm called Ghannami is preferred for fertilising purposes because it is stronger than any other. The male blossom is only used to fertilise, it does not turn into fruit. The process of fertilisation is called Telgih. It is said that in places where date palms grow close together, the wind scatters the pollen of the male blossom and the female is impregnated naturally. When, through neglect or oversight, the female palm is not artificially fertilised, the fruit it bears does not come to perfection; it is seedless and insipid and is called Shis. In 1821, during the plague, the trees were not fertilised artificially. The pollen was scattered by the wind but the crop was less good than when artificially handled.

"About one month after fertilisation the fruit forms and is then called Hababok; in two months it is green and is called Chimri; in three months, that is in June or July, it is hard but is red and yellow and is called Khalal; in four months, that is in August, it is partially ripe, soft and juicy and is called Rutab; it is then sold in the bazars as food but is not fit for preservation. If kept two or three days it turns sour. In the fifth month, 150 days from the date of fertilisation, that is about September, the fruit is fully formed and is called Tamr. It is then cut down carefully. The date cluster is called 'Ithig. When required for local consumption, the dates are spread on the ground and left to dry in the sun for about a month. For export they are sold damp to the date brokers and are brought to the packing sheds (Chardak) and are there handed over to the packers.

"Dates are packed by hand in cardboard boxes or cartons, placed in wooden cases, in baskets and in skins, according to quality and market requirements. In some cases the juice (Dibs) is extracted. It is collected in jars and used by the natives instead of sugar. The fruit is placed in a tank (Medbasa) made of sun-dried mud or cement. It is not artificially pressed. The juice exudes naturally. Dates can be packed in baskets after the juice has been thus extracted. Dates in a hard form, dry and yellow in colour, partially ripe (Khalal), are also preserved by boiling in water and are then exposed to the sun and air till they harden. This preparation, called Khishra, if well packed and preserved from damp, will keep for some time.

"A species of date called Zahdee is used for distilling arak or spirit. Zahdee dates make the best arak. Basra water is not suitable for the purpose and it is made at Bagdad.

"There are many varieties of dates and each kind has a special name. The principal kinds are as follows :—

Hallawee, the best kind at Basra, ripens early and is packed in boxes for export generally.

Khadrawee, packed in boxes for export to the United Kingdom, America and the Continent, also to Egypt, Tunis and Oran.

Sayer or S'Amran, packed in boxes and baskets for export.

Zahdee, packed for export in baskets and skins.

Deree, packed in baskets for export.

Chibchab, used for cooking in the semi-ripe stage and also eaten uncooked. They are hard and yellow.

Maktum, much smaller than Chibchab and used for the same purpose.

Hassawee, are eaten in the moist stage (Rutab), and are not sold for export.

Berhee, are eaten in the moist form and are kept in baskets, but are not exported.

'Aweydee, a kind much prized by the natives, are dried and kept for eating, but are not exported.

Ashgar, are eaten in the hard (Khalal) stage or moist (Rutab), but are not exported.

Asabi-el-Arus 'Bride's fingers,' are eaten moist and dry, but are not exported.

Khissab, ripen late, are left on the tree till the winter and then eaten in the Khalal or Rutab stage, but are not exported.

Lilwee, ripen late and are eaten in the moist and dry stages, but are not exported.

Firsee, a red date, ripens late and is kept for eating.

Guntar, are eaten moist or dry, but are not exported.

"The droppings throughout the season from the 'Ithig or date cluster are called Dosan and Hashaf. They are collected and given to cattle. Cows are fed largely on dates. Dosan are also eaten by the natives. The date palm is of great use to the poorer classes and is employed in a variety of ways. The peasants feed

on the droppings from May to September and keep the fruit when ripe as food for the ensuing seven months. The branches supply fuel and material for hutting and fencing. The fruit stalks are converted into brooms. Rope called Kumbar is made from the date fibre. The leaves are woven into matting and beds, chairs, cages, coops and household furniture are manufactured from the branches. The trunks are cut up and used in housebuilding and bridge making; they are also scooped out and converted into water pipes and gutters.

British Consulate,
Basra, March 31, 1908. F. E. Crow."

XL.—DIAGNOSES AFRICANAE: XXIV.

951. **Cotylonychia**, *Stapf*, gen. nov. [Sterculiaceae]; distinctissimum, ob flores hermaphroditos, petalorum structuram, androgynophorum brevissimum, Buettnerieis accedens, sed sepalorum aestivatione primo imbricata mox aperta et staminibus omnibus aequalibus fertilibus diversa.

Flores hermaphroditi. *Sepala* 5, libera, primo imbricata, mox aestivatione aperta, herbacea. *Petala* 5, hypogyna, libera, initio vero contorto-imbricata, mox aestivatione aperta, basi in unguem crassiusculum leviter concavum margine albo-tomentello cinctum contracta, supra in laminam lanceolatam inflexo-apiculatam producta. *Stamina* 10, aequalia, omnia fertilia, androgynophoro perbrevi pentagono inserta, episepala ad eius angulos sita; filamenta filiformia; antherae oblongae, apiculatae, thecis parallelis 2 connectivo tenui connexis. *Ovarium* inter stamina sessile, 5-loculare, loculis multiovulatis, ovulis biseriatis; stylus indivisus; stigma 5-crenatum. *Fructus* globosus, pericarpio crustaceo, caeterum imperfecte notum.

C. Chevalieri, *Stapf* (species unica).

Frutex; ramuli teretes, diu virentes, cortice laevi, tenuiter sulcato-striati, glaberrimi. *Folia* alterna, petiolata; lamina oblongo-obovata, basi subcuneata, apice abrupte breviter acuminata, 9–12 cm. longa, 5–5·5 cm. lata, papyracea, utrinque concoloria, viridia, glaberrima, nervis lateralibus utrinque 5–7 obliquis uti venis crebre anastomosantibus utrinque prominulis, ob cellulas mucilagine repletas obscure pellucido-punctata; petiolus 8–9 mm. longus. *Flores* corymboso-racemosi; racemus glaber, subsessilis, omnibus partibus ob cellulas mucilagine et acido tannico repletas magis minusve fusco-punctatis, rhachi sub anthesi circa 1 cm. demum ad 2 cm. longa; bracteae lineares vel subulatae, 1–3 mm. longae, deciduae; pedicelli filiformes, ad 1 cm. longi. *Sepala* lanceolata vel suboblonga, acuta, ad 5 mm. longa, glabra, fusco-punctata, costula prominula. *Petala* ad 15 mm. longa, ungue disciformi 2·5 mm. alto, lamina glabra ob epidermatis cellulas magnopere fornicatas tenuissime velutina, apiculo saepe induplicato-inflexo substantia tenuiore. *Androgynophorum* vix 1 mm. altum. *Filamenta* 5–6 mm. longa. *Antherae* 1·5–1·7 mm. longae. *Stylus* 5 mm. longus. *Fructus* (immaturus) globosus, ad 3 cm. diametro, apiculo 4 mm. longo instructus.

French Congo. Brazzaville, *A. Chevalier*, 11177, 11196.

In the absence of mature fruits and seeds I hesitate to express a definite opinion regarding the affinity of this new genus. The gynoecium is exactly that of *Leptonychia* and *Theobroma*, and the curiously-shaped petals may well be reduced to the type prevailing in *Buettnerieae*. The androecium, on the other hand, represents a more primitive condition than that observed in *Buettnerieae*, the stamens being all perfect, alike, and practically free to the base of the filaments; they resemble, however, the fertile stamens of *Leptonychia*. Another peculiarity is in the aestivation of the calyx and corolla. The sepals are distinctly imbricate in the young flower, but they soon cease to overlap, and the petals become visible between them. The petals assume the character of "open" aestivation at a still earlier stage. I had to go back to corollas less than 1 mm. long to find the petals imbricate, and even then the overlapping did not amount to much, and was confined to the upper part. The flowers appear therefore more or less open long before they have attained their full size and maturity. In the *Buettnerieae*, as we know them, the aestivation of the calyx is typically valvate and the edges of the sepals are correspondingly not attenuated. In *Cotylonychia* we find an indication of thinning-out along the edges, although the pale and submembranous margin is very narrow, and this is evidently due to the different conditions of aestivation. The aestivation of the calyx and the structure of the androecium afford, it seems at present, the only objections to referring *Cotylonychia* to the *Buettnerieae*; but it must be admitted that they are serious objections, and when more material is at hand the question will have to be considered whether the genus here described should not be taken as representing a distinct and more primitive tribe.

952. **Corchorus discolor**, *N. E. Brown* [Tiliaceae]; affinis *C. hirsuto*, Linn., foliis supra glabris et fructu ellipsoideo setis filiformibus longis densissime obtecto facile distinguitur.

Caules 30 cm. vel ultra longi, erecti, ramosi, lignosi, superne pilis stellatis tomentosi. *Foliorum* petioli 5–11 mm. longi; laminae 2–6 cm. longae, 1–2·6 cm. latae, oblongae vel oblongo-lanceolatae, obtusae vel subacutae, argute serratae, supra glabrae, subtus cinereo-albidae, pilis stellatis minutis densissime tomentosae; stipulae 5–9 mm. longae, subulato-filiformes. *Flores* capitati; capituli globosi, multiflori, pedunculati, ad nodos laterales et terminales, tomentosi. *Pedunculi* 0·5–2·5 cm. longi. *Bracteoli* 8–10 mm. longi, subulati. *Pedicelli* 2–7 mm. longi. *Sepala* 1 cm. longa, 2·5 mm. lata, lanceolata, subulato-acuminata. *Petala* 7–8 mm. longa, 4 mm. lata, obovata, apice rotundata, glabra, lutea. *Stamina* numerosa, glabra. *Ovarium* oblongum, dense piloso-tomentosum, 4-loculare, loculis 10–12-ovulatis; stylus brevis, 1·5 mm. longus; stigma leviter incrassata. *Capsula* 1·5–2 cm. longa, 1·4–1·7 cm. diam., ellipsoidea, obtusa, setis tenuissimis filiformibus flexuosis minute pilosis 5–7 mm. longis densissime obtecta.

Natal. Near Stanger, *Wood*, 10186, and without precise locality, *Gerrard*, 1130.

953. **Corchorus Junodi**, *N. E. Brown* [Tiliaceae]; affinis *C. discolori*, N. E. Br., foliis supra minute velutino-puberulis et setis

capsulae multo brevioribus crassioribus rectis dense subtomentosis et loculis ovarii pluriovulatis differt.—*Triumfetta Junodi*, Schinz. in Mem. Herb. Boiss. X., p. 49.

South Africa. Delagoa Bay, *Forbes! Monteiro*, 40! *Junod!* Lourenço Marques (distributed as C. hirsutus, *L.*), *Schlechter*, 11516!

As this plant has several ovules in each cell of the ovary, it clearly belongs to the genus *Corchorus*, and is closely allied to the above-described *C. discolor*, from which it conspicuously differs by the characters mentioned.

954. **Corchorus Kirkii**, *N. E. Brown* [Tiliaceae]; affinis *C. hirsuto*, Linn., foliis longioribus, sepalis multo angustioribus et petalis ovatis (nec obovatis) quam sepalis multo brevioribus differt.

Frutex 2–3 pedalis. *Rami* fulvo-tomentosi, demum cinerei. *Foliorum* petioli 4–13 mm. longi; lamina 2–10 cm. longa, 1–2·8 cm. lata, lanceolata, obtusa vel subacuta, basi rotundata vel cuneato-rotundata, serrato-dentata, utrinque densissime velutino-stellato-tomentosa. *Stipulae* 2–3 mm. longae, subulatae, caducae. *Umbellae* axillares, 4–10 florae, dense velutino-tomentosae. *Pedunculi* 2–7 mm. longi. *Bracteae* 1·5–2 mm. longi, filiformes. *Pedicelli* 2–5 mm. longi. *Sepala* 6·5–7·5 mm. longa, 1·5 mm. lata, angustissime lanceolata, subulato-acuminata, concava. *Petala* 5–6 mm. longa, 3 mm. lata, ovata, obtusa, basi in unguem brevem contracta, glabra, lutea. *Stamina* indefinita, 4–4·5 mm. longa, glabra. *Ovarium* ellipsoideum, obscure multi-costatum, puberulum, stylo glabro. *Capsula* 1·3–2 cm. longa.

Portuguese East Africa. Lower Zambesi at Tete, *Kirk*, between Lupata and Tete, *Kirk*, and above Lupata, *Kirk*, 285.

955. **Hemandradenia**, *Stapf*, gen. nov. [Connaraceae-Cnestideae]; affinis *Ellipantho*, Hook. f., sed staminibus epipetalis ad glandulas carnosas reductis, fructu indehiscente, pericarpio tenuiter crustaceo, semine arillo tenui induto et endospermio osseo copioso distincta.

Calyx 5-partitus, post anthesin persistens, haud vero auctus, segmentis valvatis. *Petala* lineari-oblonga. *Stamina* antherifera 5, sepalis opposita, cum totidem staminodiis glanduliformibus carnosis alternantia, filamentis tenuiter filiformibus e flore exsertis, antheris parvis thecis late oblongis parallelis. *Carpellum* 1, oblique ovoideum, tomentosum, in stylum filiformem attenuatum, stigmate lobulato; ovula 2, collateralia. Fructus indehiscens, oblongus, estipitatus, pericarpio tenuiter crustaceo intus glabro. *Semen* unicum, omnino arillo exsiccando tenui indutum; testa coriacea; endospermium copiosum, cartilagineum. *Embryo* cotyledonibus planis tenuibus quam endospermio angustioribus, radicula brevi.

H. Mannii, *Stapf*.

Arbuscula, 3 m. alta, ramis gracilibus, novellis fulvo-tomentellis demum glabratis cortice fusco vel cinerascente tectis. *Folia* simplicia, petiolo supra medium articulato 0·7–1 cm. longo suffulta, late elliptico-oblonga, abrupte longiuscule acuminata, basi obtusa, 10–17 cm. longa, 5–7 c.m. lata, tenuiter coriacea, supra nitida,

glaberrima, infra opaca, juniora adpresse fulvo-pubescentia imprimis in costa, tandem glabrata, nervis obliquis utrinque circiter 7 sub margine arcuatim connexis, venis anastomosantibus obscuris. *Flores* in glomerulos parvos axillares fulvo-tomentosos arcte congesti, sessiles. *Calyx* fulvo-tomentosus, 4–4·5 mm. longus; segmenta lanceolata, acuta, ima basi tantum connata. *Petala* ignota. *Filamenta* glabra, tenuia, 7 mm. longa; antherae vix 0·5 mm. longae. *Ovarium* cum stylo fulvo-tomentello 3·5 mm. longum; ovula subbasalia. *Fructus* fere 4 cm. longus, 1·75 cm. latus, rubro-purpureus, pube fulvo denso tenui obtectus. *Semen* ambitu oblongum, fuscum, 18 mm. longum, 7 mm. diametro. *Cotyledones* 13 mm. longae, 4 mm. latae, 3-nerves; radicula 1 mm. longa.

Gaboon. River Muni, *Mann*, 1763.

956. **Hemandradenia**(?) **Chevalieri**, *Stapf* [Connaraceae-Cnestideae]; ab *H. Mannii* differt foliis angustioribus pulchre reticulatis, floribus paniculatis, calyce multo breviore et filamentis pubescentibus.

Arbuscula (?), ramis tenuissime fulvo-tomentellis tandem glabratis cortice fusco tectis. *Folia* petiolo 0·6–0·8 cm. longo sub apice articulato suffulta, oblonga, obtusiuscule subacuminata, basi obtusa, 9–12 cm. longa, 3–4·5 cm. lata, tenuiter coriacea, supra nitida, glaberrima, juniora infra tenuissime adpresse pubescentia, mox glabrata, nervis obliquis utrinque 7–8 sub margine arcuatim connexis, ob venas arcte anastomosantes prominulas utrinque reticulata. *Flores* 5–7-meri, pauci vel ultra 12 in glomerulos parvos tenuissime tomentellos congesti; glomeruli in ramulis gracilibus 3–6 cm. longis geminatis axillaribus vel paniculatim dispositis siti; pedicelli persistentes, 2 mm. longi; bracteae obscurae. *Calyx* griseo-fulvo-tomentellus, 2 mm. longus, segmentis magis minusve patentibus late ovatis vel triangularibus subacutis. *Petala* lineari-oblonga, apicibus recurvis, griseo-tomentella, 4 mm. longa, paulo ultra 1 mm. lata. *Filamenta* minute pubescentia, 5–5·5 mm. lata; antherae ad 0·8 mm. longae. *Ovarium* cum stylo pubescente ultra 4 mm. longum; ovula paulo infra medium loculi orta. *Fructus* immaturus estipitatus, oblongus, cinereo-fulvo-velutinus. *Semen* (immaturum) unicum evolutum.

Upper Guinea. Ivory Coast, basin of the Cavally River, on the shore between Cabou and Bériby, *A. Chevalier*, No. 19,943.

Considering only the flower, the two plants here described might be referred to *Ellipanthus*, where a similar reduction of the androecium sometimes occurs (e.g. *E. Thwaitesii*, Hook. f.); but the structure of the fruit and seed, as represented in Mann's specimens, is totally different. Unfortunately, Chevalier's plant exhibits only flowers and very young fruits; but on the whole it repeats the facies of *H. Mannii* to such an extent that I feel little hesitation in treating it for the present as congeneric with it. I have, however, to add that Mr. L. A. Boodle, who was good enough to examine the specimens anatomically, informs me that *H. Chevalieri* possesses cortical leaf traces which are equally absent in *H. Mannii* and *Ellipanthus Griffithii*, the latter a typical representative of the genus *Ellipanthus*. Another peculiarity of *H. Chevalieri* is the occasional occurence of 6- and

7-merous flowers. In the bud of one of the hexamerous flowers slight imbrication could be observed at the very base of the segments. There were two outermost and two innermost segments, and two which were overlapping on one side and overlapped on the other. This imbrication was, however, not to be compared with the distinctly imbricate aestivation of the Connareae and Jollydoreae. The latter also have indehiscent fruits like *Hemandradenia*, but endospermless seeds with large fleshy cotyledons.

957. **Calliandra xylocarpa**, *Sprague* [Leguminosae-Mimoseae] ; species insignis leguminibus lignosis, in seriem *Racemosarum* circa *C. Houstoni* ponenda, a qua pinnis paucioribus, foliolis majoribus pro rata latioribus necnon leguminibus recedit.

Stirps arborescens, inermis. *Ramuli* circiter 5 mm. diametro, teretes, fusci, lenticellis parvis crebre punctati, juniores dense pubescentes. *Internodia* 1·5–4 cm. longa. *Stipulae* subulatae, 3–4 mm. longae, persistentes. *Folii rhachis* 5–15 cm. longa, sicut rhachiolae pilosa, petiolo communi paullo longiore quam internodiis pinnarum ; pinnae 3–7-jugae ; foliola 10–15-juga, oblonga vel anguste oblonga, 1–2 cm. longa, 4–6 mm. lata, apice rotundata vel retusa, basi inaequaliter rotundata, chartacea, utrinque crebre subtus conspicue reticulata, supra nitidula, fusca, glabra, subtus pallidiora, minute puberula. *Panicula* terminalis, 12–15 cm. longa, ramulis arcuato-ascendentibus. *Legumen* lignosum, 7–10 cm. longum, circiter 1·5 cm. latum, apice interdum subuncinatum. *Semina* oblonga, 1·7–2 cm. longa, 1 cm. lata.

PORTUGUESE EAST AFRICA. Lupata, *Kirk*.

Calliandra has not hitherto been recorded from Africa, if we except the doubtfully indigenous *C. portoricensis*. The genus now includes over 130 described species, and their distribution is as follows :—3 in India, 4 in Madagascar, 1 in Tropical Africa, and the remainder in America. Most of the American species are found between the tropics, but a few occur in the Southern United States, and others in the warmer parts of the Argentine Republic and Chili.

958. **Aizoon Burchellii**, *N. E. Brown* [Ficoideae] ; affinis *A. asbestino*, Schltr., foliis lineari-lanceolatis complicatis pilis longis argenteis adpressis vestitis differt.

Planta 7·5–12 cm. alta, e radice crassa lignosa ramosa. *Rami* erecti vel adscendentes, rigidissimi, 3–5 mm. crassi, lignosi, apice foliosi, inferne foliorum vaginis obtecti. *Folia* conferta, erecta, opposita, 1–2·8 cm. longa, 2–7 mm. lata, lineari-lanceolata vel anguste lanceolata, acuta, basi in petiolum vaginantem angustata, pilis longis argenteis adpressis et laxe subpatentibus utrinque vestita. *Flores* axillares, sessiles, conferti, secundi. *Calycis lobi* 3·5–4 mm. longi, ovati vel ovato-lanceolati, intra glabri, extra pilis adpressis vestiti. *Stamina* 10–20 (*Burchell*). *Capsula* apice truncata, papillosa, margine subhispido-pilosa, 5-locularis ; loculi polyspermi ; styli 5, filiformes.

SOUTH AFRICA. Griqualand West ; Herbert Div., along the right bank of the Vaal River, between the confluence of the Riet River and Sand Drift, *Burchell*, 1753.

This species has a very distinct and rather singular appearance, the rigid branches bearing leaves at the apex only, and having two rows of old persistent contiguous capsules or their remains extending along one side of the branches from their very base to the base of the tuft of leaves. The stamens had all been destroyed by insects in the few flowers examined, but Burchell in his MS. note states that they are 10–20 in number ; he also states that the flowers have no styles, but on the only perfect capsule I have examined there were five ; possibly the flowers are subunisexual.

959. **Aizoon rarum**, *N. E. Brown* [Ficoideae] ; affinis *A. hispanico*, Linn., foliis longioribus, sepalis brevioribus obtusioribusque et indumento differt.

Herba annua, basi in ramos 5–6 decumbentes divisa. *Rami* 15–30 cm. longi, superne in ramos 2–4 cymoso-furcati, adpresse pubescentes, internodiis inferioribus 3–6 cm. longis, superioribus 0·8–2·5 cm. longis. *Folia* radicalia subrosulata, 8–10 cm. longa, 8–18 mm. lata, oblanceolata vel lineari-lanceolata ; folia caulina inferiora opposita, superiora alterna, 1·5–4 cm. longa, lanceolata vel oblanceolata, omnia acuta vel obtusa, basi longe attenuata, papillosa, pilis adpressis tenuiter obtecta, demum glabra. *Flores* axillares vel in furcis sessiles, distantes. *Calycis lobi* 6–7 mm. longi, ovati, obtusi, extra pilis longis albis adpressis dense vestiti, intra glabri, rosei (*Burchell*). *Stamina* 50–60, quinque-fasciculata. *Ovarium* apice depresso-truncatum, 5-angulare, glabrum ; styli 5, filiformes.—*A. lanceolatum*, Burchell, Trav., vol. i., p. 181, non Murray, nomen tantum.

South Africa. Tulbagh Div. : in New Kloof, near Tulbagh, *Burchell*, 1013.

This must be an exceedingly rare plant. Burchell collected it on June 26th, 1811, but only found one specimen, and since that date no other collector appears to have collected it, although the locality is on the main road between Cape Town and Tulbagh, and most South African collectors have botanised there more than once.

960. **Stipularia efulenensis**, *Hutchinson* [Rubiaceae-Mussaendeae] ; affinis *S. gabonicae*, Hiern, sed foliis latioribus ovato-ellipticis, petiolis crassioribus brevioribus et calycis lobis longe ciliatis differt.

Frutex scandens (teste *Bates*), ramis adultis striatis tenuiter pubescentibus, junioribus dense tomentosis. *Folia* ovato-elliptica, acute acuminata, 6–13 cm. longa, 5–8 cm. lata, utrinque parce villosa, nervis lateralibus utrinque 10–15 oblique patulis distinctis subtus longe pubescentibus, venis laxe anastomosantibus supra indistinctis subtus conspicuis ; petioli 5–13 mm. longi, tomentosi ; stipulae ovato-lanceolatae, acutae, 10 mm. longae, 5 mm. latae, intus glaberrimae, extus tenuiter tomentosae. *Capitula* 10-flora, breviter pedunculata, pedunculo 5 mm. longo tomentoso. *Involucri bracteae* 2, membranaceae, 2 cm. longae, 2·5 cm. latae, alte bilobatae, intus glabrae, extus tenuiter pubescentes. *Flores* sessiles, albi. *Receptaculum* 3 mm. longum, minute pubescens. *Calycis tubus* inaequaliter 5-lobatus, 7 mm. longus, utrinque appresse pubescens, lobis lanceolatis acutis 5–8 mm. longis 1–2 mm. latis 3–4-nerviis

longe ciliatis. *Corollae tubus* 2 cm. longus, 1·5 mm. diametro, extus inferne glaber, superne longe appresse pilosus, intus tenuiter pubescens, lobis ovatis acutis 3 mm. longis. *Antherae* 4 mm. longae, 1·2 cm. infra faucem insertae, filamentis 3 mm. longis. *Ovarium* 5-loculare, stylo incluso glabro alte trilobato, lobis oblongis 3–4 mm. longis obtusis. *Fructus* ignotus.

West Tropical Africa. Cameroons, in forest at Efulen, *Bates*, 439.

961. **Randia angolensis**, *Hutchinson* [Rubiaceae-Gardenieae]; affinis *R. maculatae*, DC., a qua foliis subtus tomentosis, calycis lobis longioribus et corollae tubo breviore tomentoso recedit.

Frutex parvus (teste Wellman). *Rami* inermes, apices versus tetragoni, dense tomentosi. *Folia* anguste oblonga vel oblanceolata, 5–10 cm. longa, 1·5–3 cm. lata, apice rotundata, utrinque subtus magis pubescentia, nervis lateralibus patulis utrinque 14–16 supra impressis subtus elevatis; petioli 3–7 mm. longi; stipulae oblongo-ovatae, 6–9 mm. longae, 3–4 mm. latae, obtusae vel breviter acuminatae, utrinque tomentosae. *Flores* in axillis solitarii; pedunculi 1–1·5 cm. longi, dense tomentosi. *Receptaculum* oblongo-obconicum, 4 mm. longum, tomentosum. *Calyx* usque ad basin partitus; segmenta oblonga, 1–1·2 cm. longa, 2–3 mm. lata, 1-nervia, utrinque tenuiter pubescentia, basi glanduligera, glandulis elongato-oblongis 12–14 pro segmento. *Corolla* hypocraterimorpha; tubus 5–6 cm. longus, 1·5 mm. diametro, extus tomentosus, intus superne pubescens; lobi ovato-lanceolati, acuti, 2–3 cm. longi, 0·8–1 cm. lati, subtus sparse sericei, supra glabri. *Antherae* 1·3 cm. longae, supra medium affixae, 8 mm. infra sinus insertae. *Ovarium* 2-loculare, circiter 3 mm. diametro; stylus gracilis, 1·5 cm. longus, glaber. *Fructus* globosus, 1 cm. diametro, tomentosus. *Semina* irregulariter pluriangulata, nitida.

Angola. At a point Lon. E. 15° 05′; Lat. S. 12° 44′; alt. 1360 m., *Wellman*, 1826. Flowering in the wet season.

962. **Chironia (Roeslinia) baccifera**, *Linn.* var. **Burchellii**, *Prain* [Gentianaceae-Chironieae]; a *C. baccifera*, Linn., typica, differt foliis patentibus anguste-oblongis apice obtusis vel subacutis recurvatis 8–12 mm. longis 3 mm. latis, lobisque calycinis rotundatis. *C. baccifera*, Griseb. in Gen. et Sp. Gent. 105 et in DC. Prodr. ix. 41; E. Mey. Comm. Pl. Afr. Austr. 180; Gilg ex Zahlbr. in Ann. Naturhist. Hofmus., Wien, xv. 65, partim; vix Linn. *C. baccifera*, var. *dilatata*, Schoch in Bot. Centralbl. Beih. xiv. 189 partim; vix E. Mey.

S. Africa. Cape Colony; Clan William Div.; Alexander's Kloof, *Wallich*. Tulbagh Div.; New Kloof, *Drège*. Paarl Div.; Paarl Mountain, *Drège*, 1895. Cape Div.; near Cape Town, *Thunberg; Banks; Wallich*; *Krauss; Ecklon; Rehmann*, 1895. Simons Bay, *MacGillivray*, 620. Simon's Town, *Wolley Dod*, 680. Worcester Div.; Bains Kloof, *Wawra*, 56. Riversdale Div.; Gouritz River, *Penther*, 2013; and without precise locality, *Rust*, 261. George Div.; Montagu, 1000 ft., *Marloth*, 2799. Uitenhage Div.; *Zeyher*. Bathurst Div.; Mouth of the Great

Fish River, *Burchell*, 3739; Port Alfred, *Haagner*, 74. Albany Div.; Assegai Bosch, *Baur*, 1028; Fish River Heights, *Hutton*.

This variety, which has been treated by Schoch as part of the var. *dilatata* distinguished by E. Meyer (Comm. Pl. Afr. Austr. 180), certainly serves to connect Meyer's variety, which has subspathulata oblong-obtuse leaves, 2–2·5 cm. long, and 4–6 mm. wide, with typical *C. baccifera*, but it seems preferable to follow Burchell in recognising it as a distinct variety, which he did in a field note dated 22 September, 1813. As Burchell remarks in that note, this variety has altogether the habit of typical *C. baccifera* which is hardly the case as regards var. *dilatata*.

The large-flowered form of *C. baccifera*, confined to a restricted area in the Uitenhage and Port Elizabeth Divisions, distinguished by Grisebach as var. *grandiflora*, which has been relegated by more recent writers to typical *C. baccifera*, is quite entitled to the status accorded to it by its author. On the other hand, the form recognised by E. Meyer as var. *elongata*, with unusually long pedicels, which is based on a specimen that has the distinction of being the only authentic record of the existence of *C. baccifera* beyond the Coast Region of Cape Colony, is not really varietally separable from *C. baccifera* proper.

963. **Chironia (Linochiron) gracilis**, *Salisb.* [Gentianaceae-Chironieae]; species *C. emarginatae*, Jarosz, quam maxime affinis; differt tamen calyce altius lobato, lobis lanceolatis vel anguste oblongis, nec late triangulis basi subauriculatis.

Suffrutex erecta, glabra. *Caulis* 10–20 cm. altus, obscure 4-gonus, ramosus, ramis gracilibus virgatis. *Folia* numerosa, anguste linearia vel subulata, opposita, decussata, 1·5–3 cm. longa, 1–1·5 mm. lata. *Flores* 1–3 terminales, pedunculis gracilibus 1·25–2·5 cm. longis. *Calyx* alte 5-fidus, 0·75–1 cm. longus, lobis lanceolatis vel anguste oblongis saepius tandem subpatentibus tubo parum longioribus. *Corolla* 5-loba, tubo anguste campanulato calyce breviore, lobis oblongis vel ovatis obtusis vel subacutis 8–12 mm. longis 6–7 mm. latis. *Stamina* in parte superiore tubi corollae inserta; antherae rectae vel minopere curvatae. *Ovarium* ovoideum, obtusum, 6 mm. longum. *Capsula* oblonga, obtusa, 8 mm. longa. *C. linoides*, Thunb. Prodr. Pl. Cap. 35, et in Trans. Linn. Soc. vii. 252, et Flor. Cap. ii. 108; Willd. Sp. Pl. i. 2, 1070; Burch. Trav. i. 19; Griseb. in Gen. et Sp. Gent. 105 et in DC. Prodr. ix. 41, syn. *C. uniflora*, Eckl., non Lamk. excl.; Eckl. Un. It. n. 40; Schoch in Bot. Centralbl. Beih. xiv. 203, t. 16, fig. 4; nec Linn. *C. linoides* var. *subulata*, E. Mey. Comm. Pl. Afr. Austr. 180; Schoch in Bot. Centralbl. Beitr. xiv. 203, syn. var. *Zeyheri*, Griseb., excl. *C. lychnoides*, Cham. et Schlecht. in Linnaea i. 190, syn. *C. emarginata*, Jarosz, excl.; nec Berg. *C. vulgaris*, var. *intermedia*, Cham. in Linnaea vi. 343.

S. Africa. Without locality, *Sparrmann; Osbeck; Burmann; Zeyher*, 237; *Krauss*, 458; *Lehmann; Thom; Reynaud; Belanger*. Cape Colony: Van Rhynsdorp Div.; Windhoek, *Niven*. Tulbagh Div.; New Kloof, *Zeyher;* Tulbagh Kloof, *Ecklon;* Elands Kloof, 1000–1500 ft., *Drège*, 1894. Worcester Div.; near Dutoits Kloof, 1500–2000 ft., *Drège;* near Vogel Valley, *Ecklon;* mountains near Worcester, *Rehmann*, 2491.

Cape Div.; Cape Flats, *Banks & Solander; Roxburgh; Halfer; Wallich; Bunbury; Burchell*, 76; *Zeyher*, 1197 partly; *C. H. Bergius; Ecklon*, 642; Table Mountain, *Ecklon*, 40; Devil's Mountain, *Bunbury*. Caledon Div.; hills near Grabouw, 1000 ft., *Bolus*, 4180, *Kensit* (Herb. Bolus 10482); Zwarte Berg, *Zeyher*, 3424; between Brand Vley and Villiersdorp, *Bolus*, 12977; near Caledon, *Pappe;* Steenbrass River, 1150 ft., *Marloth*, 2848. Swellendam Div.; *Thunberg, Ludwig*. Riversdale Div.; near Garcia's Pass, *Burchell*, 7147.

Var. **macrocalyx**, *Prain;* varietas a forma typica recedens foliis parum latioribus 2 mm. latis, floribusque majoribus, calyce 1·25 cm. longo, lobis late triangulis, corollae lobis 1·75 cm. longis 0·75–1 cm. latis oblongis obtusis vel retusis. *C. lychnoides*, Thunb. Prodr. Pl. Cap. 35, et in Trans. Linn. Soc. vii. 252, et Flor. Cap. ii. 108, partim; nec Berg.

S. Africa. Cape Colony: Cape Div.; Cape Flats, *Sonnerat; Wallich; Hooker*, 607; *Ecklon*, 644; *Lalande;* Constantia, *Mrs. Jameson;* Simons Bay, *MacGillivray*, 619; *Milne*, 214; *Harvey*; *Wright*. Swellendam Div.; hills near Hottentots Holland, *Thunberg; Krauss*. Knysna Div.; salt marshes and moist places, *Bowie*, 5; Plettenbergs Bay, *Bowie*.

This species has been so generally confounded with *C. emarginata*, Jarosz, and the two have been so often treated as forms of *C. linoides*, Linn., that a somewhat perplexing synonymy has resulted. Whether *C. gracilis* as a whole be really specifically distinct from *C. emarginata*, which differs in having shorter, broader calyx-lobes that are subauriculate and overlap at the base, is a matter that must be left for decision by field botanists in South Africa. Chamisso, Meyer and Grisebach in herbaria, Zeyher and Ecklon in the field, have treated the three forms as at least distinct varieties, while Schoch has recently definitely demonstrated that the true *C. linoides*, Linn., is entitled to specific rank. Schoch has, however, given the name used by Linnaeus to the present species, which is not included in the citations given in the first edition of the *Species Plantarum* and is not the well-known garden plant intended by Linnaeus. The typical form of the present plant does not appear to have ever been cultivated in Europe, though there exist specimens of the variety here described derived from plants grown in Hort. D. Macky in 1807. In consequence of the application of the Linnaean name to this species, Schoch has been led to propose, for the true *C. linoides*, a new name *C. Ecklonii*.

To the courtesy of Dr. Rendle, Keeper of the Botanical Department, British Museum, we are indebted for the opportunity of consulting an unpublished monograph by R. Salisbury of the species of *Chironia* indigenous to the Cape of Good Hope, illustrated by a series of careful drawings. In this monograph the treatment of the various Cape forms is clear and satisfactory and it is interesting to find that the name proposed by Salisbury for the present species can still be taken up.

The plant here treated as var. *macrocalyx* is very distinct in general appearance both from *C. gracilis* proper and from *C. emarginata*. As regards calyx, it is intermediate between the two,

but it has larger flowers and wider leaves than either; its appearance and its comparative rarity suggests that it may be a natural hybrid between *C. emarginata* and *C. gracilis* rather than an intermediate condition of a somewhat variable species in which all three forms are to be included. This also is a point that must be left for settlement by field botanists at the Cape.

It may be noted that while, in herbarium specimens, the true *C. linoides* dries pale green, both *C. gracilis* and *C. emarginata* dry brown.

It has to be added that there is in the Delessert Herbarium a specimen of *C. gracilis* collected by Verreaux and said to be from Uitenhage; also that in the Vienna Herbarium there is another, collected by Poeppig, said to be from Port Natal. These two localities must, however, for the moment be considered as requiring verification.

964. **Chironia (Linochiron) Zeyheri**, *Prain* [Gentianaceae-Chironieae]; species *C. linoidi*, Linn., proxima; differt foliis elliptico- vel lanceolato-spathulatis, calycis lobis obtusis, corollaeque tubo calyce manifeste breviore.

Suffrutex erecta, glabra, glauca. *Caulis* 30–45 cm. altus, obscure 4-gonus, versus apicem ramosus, ramis ascendentibus. *Folia* numerosa, anguste elliptico-spathulata, opposita, decussata, apice obtusa vel subacuta, basi angustata, 3·5–5 cm. longa, 6 mm. lata. *Flores* 1–3, terminales, pedunculis 0·75–1·15 cm. longis. *Calyx* 5-fidus, 6 mm. longus, lobis ovatis obtusis mucronulatis. *Corolla* 5-loba, tubo anguste campanulato calyce breviore, lobis ellipticis obtusis 1 cm. longis 6 mm. latis. *Stamina* in parte superiore tubi corollae inserta; filamenta basi dilatata; antherae rectae. *Ovarium* ovoideum, obtusum, 6 mm. longum.

South Africa. Cape Colony; Clanwilliam Div., Companies Drift, Berg Valley River, *Zeyher*, 1198.

Var. **angustifolia**, *Prain;* varietas a forma typica recedens foliis anguste lanceolato-spathulatis 3 mm. latis, calycisque lobis ovato-lanceolatis obtusis. *C. linoides*, E. Mey., Comm. Pl. Afr. Austr. 179 quoad specimina Dregeana apud Wupperthal lecta tantum, nec Linn.

South Africa. Cape Colony; Clanwilliam Div.; Wupperthal, 1,800 ft., *Drège;* by the Olifants River and near Brakfontein, *Ecklon;* near Clanwilliam Village, *Leipoldt*, 360.

The typical form of this very distinct species has much the facies of *Orphium frutescens*, with which in some collections it has been placed. The narrow-leaved form has, on the other hand, been issued by E. Meyer along with *C. linoides*, to which species it is most closely related, though it differs as regards the length of the corolla tube, and still more markedly as regards calyx. This species is unlike most of the other species of the genus in drying black.

965. **Chironia (Heterochiron) Bansei**, *Prain* [Gentianaceae-Chironieae]; species distincta, habitu *C. linoidi* accedens; differt tamen corollae tubo cylindrico, calyce altius fisso, pedunculis calycisque lobis parce puberulis.

Suffrutex erectus, pedunculis calycisque lobis parce puberulis exceptis glaber. *Caulis* saltem 30 cm. altus, obscure 4-gonus, versus apicem ramosus, ramis plerumque alternis ascendentibus. *Folia* numerosa, lanceolata, acuta, 3–4·5 cm. longa, 5–6 mm. lata. *Flores* singuli vel 2–5, pedunculis versus apices ramorum alternis 2–3 cm. longis sub calycem parce puberulis. *Calyx* 5-partitus, 1·25 cm. longus, lobis oblongis subacutis vel acutis extra basi parce puberulis. *Corolla* 5-loba, tubo cylindrico calyci aequilongo, lobis ellipticis obtusis 2 cm. longis, 1·25 cm. latis. *Stamina* versus apicem corollae tubo affixa ; antherae parum contortae. *Ovarium* ovoideum, subacutum, 8 mm. longum.

South Africa. Without locality : *Cult. specimen in Herb. Berlin.*

The specimen from which the accompanying description has been made was collected in the Kgl. Bot. Garden, Berlin, by Banse, and is marked "C. peduncularis, *Lindl.* : C. Barclayana, *Hort.*" The plant from which it was taken was believed to be from the Cape, but there are no African specimens of this form in any collection we have examined.

C. Bansei bears little resemblance to the true *C. Barclayana*, which is, as Grisebach has noted, the same as *C. peduncularis*, Lindl. It most resembles *C. linoides*, but is larger in all its parts ; the calyx, moreover, is more deeply divided, and its lobes do not have the white margins or the keels characteristic of *C. linoides ;* they are besides faintly puberulous outside near the base. The corolla, too, is very unlike that of *C. linoides*, or of any other member of the section *Linochiron*, and most resembles that of *Orphium frutescens*, E. Mey., a species which *C. Bansei* further recalls in having slightly puberulous peduncles and calyx-lobes. This combination of characters, and the fact that, so far as is known, this plant has only been met with in cultivation, suggests the possibility of hybrid origin. As the inclusion of this form in any of the hitherto characterised sections of the genus would involve a violation of their natural characters, it is preferable to treat it as the representative of a distinct section intermediate between *Linochiron* and *Pseudosabbatia.*

We are indebted to Professor A. Engler for an opportunity of examining this plant.

966. **Chironia (Pseudosabbatia) flexuosa**, *Bak.* [Gentianaceae-Chironieae] ; species gracilis *C. transvaalensi*, Gilg., proxima, foliis caulinis tamen angustioribus, floribusque multo minoribus differt.

Herba erecta, glabra. *Caulis* 45 cm. altus, teres, simplex vel parce ramosus, ramis fastigiatis. *Folia* radicalia subrosulata, cito evanida, oblongo-ovata, obtusa, 2 cm. longa, 1 cm. lata, caulina opposita, decussata, paria circa 8, inter se 3–7 cm. remota, linearilanceolata, 2·5–3 cm. longa, 3–4 mm. lata. *Cymae* 1–3-florae, in paniculam terminalem dispositae, pedunculis gracilibus suberectis 1–1·5 cm. longis. *Calyx* 5-fidus, 6 mm. longus, lobis triangulis acutis extra carinatis tubo aequilongis. *Corolla* 1 cm. longa, tubo anguste campanulato calyci aequilongo, lobis anguste ovatis obtusis vel subacutis 6 mm. longis 2·5 mm. latis. *Stamina* 1 mm.

sub loborum sinibus inserta ; filamenta antheris parum breviora ; antherae parum contortae. *Ovarium* oblongum, apice acutum, 8 mm. longum ; stylus 3 mm. longus ; stigma 2-lobum.

North-east Rhodesia. Kambole, south-west of Lake Tanganyika, at about 5,000 ft., *Nutt !*

967. **Chironia (Hippochiron) Peglerae**, *Prain* [Gentianaceae-Chironieae] ; species *C. pedunculari*, Lindl., proxima ; differt tamen foliis minoribus tenuioribus, caule erecto angulari et floribus minoribus, antherisque manifeste contortis.

Herba erecta, glabra. *Caulis* 30 cm. altus, distincte 4-gonus, ramosissimus, ramis gracilibus 4-gonis ascendentibus. *Folia* numerosa, late ovata, basi rotundata, apice obtusa vel subacuta, opposita, decussata, 3–5-nervia, nervo centrali ceteris robustiore, 1·5–2 cm. longa, ·75–1 cm. lata. *Flores* terminales et in axillis summis solitarii, pedunculis gracilibus 4-gonis 3·5–5 cm. longis. *Calyx* 5-sectus, 2·25 cm. longus, lobis lineari-subulatis, tubo subnullo. *Corolla* 2·5 cm. longa, tubo anguste cylindrico calyce vix aequilongo, fauce parum contracta, lobis ovato-lanceolatis, acuminatis 8 mm. longis, 3 mm. latis. *Stamina* parum sub loborum sinibus inserta ; antherae distincte contortae. *Ovarium* anguste oblongum, acutum, 8 mm. longum. *Capsula* oblonga, acuta, 2 cm. longa, 5 mm. lata.

South Africa. Transkei ; in valleys in the Kentani District at 1,000 ft., *Miss A. Pegler*, 428 !

Miss Pegler notes that the flowers are pink and open only in the mornings. This very distinct species is evidently most closely related to *C. peduncularis*, Lindl., from which, however, it differs in the points noted above. The consistence of the leaves and the general facies of the plant recalls various species of the section *Plocandra*, where also the calyx-lobes are free almost to the base ; with these it further agrees in having much twisted stamens. The narrow corolla-tube, somewhat constricted just under the limb, shows, however, that the more natural position of *C. Peglerae* is in the section *Hippochiron*, though it serves as a link connecting that section with *Plocandra*, in which the corolla tube is very short, and widened under the limb.

We are indebted to Dr. Bolus for an opportunity of studying the specimen from which the description of *C. Peglerae* has been made.

968. **Chironia (Ixochiron) scabrida, *Griseb.* var. ligulifolia**, *Prain* [Gentianaceae-Chironieae] ; varietas a *C. scabrida*, Griseb., typica foliis oblongo-lanceolatis vel lanceolatis 3–6 mm. latis, nec ellipticis oblongisve, 6–8 mm. latis, tuboque corolla calyce vix longiore recedens. *C. jasminoides*, Cham. in Linnaea vi. 344 (quoad specimina in planitie capensi lecta tantum) ; Knobl. in Bot. Centralbl. lx. 328, quoad syn. *C. viscosa ;* nec Linn. *C. jasminoides*, var. *β*, Banks ex Edw. Bot. Reg. iii. sub t. 197. *C. jasminoides*, var. *lychnoides*, Griseb., Gen. & Sp. Gent. 102 (quoad specimina ab Ecklon lecta tantum) et in DC. Prodr. ix. 40. *C. viscosa*, Zeyh. ex Griseb. in DC. Prodr. ix. 40. *C. tetragona*, Schoch in Bot. Centralbl. Beitr. xiv. 196, quoad syn. *C. viscosa ;* nec Linn. f. *C. tetragona*, var. *linearis*, Griseb.

in DC. Prodr. ix. 40, quoad syn. *C. viscosa*; nec E. Mey.: *C. ligulifolia*, Salisb. Mss. in Herb Brit. Mus.

South Africa. Without locality; *Sonnerat*; *Burmann*; *Buettner*; *Banks*; *Wallich*; *Nelson*; *Brown*; *Sieber*; *Thom*, 769; *Drège*. Cape Colony: Cape Div., Cape Flats, *Rehmann*, 1972; Under Tiger Berg, near Riet Valley, *Ecklon*, 176, 262; near Cape Town, *Hesse*; Blue Berg, *Zeyher*, 1200; near Durban Road, 100 ft., *MacOwan*, 96; and in *MacOwan & Bolus*, *Herb. Norm.*, 961. Uitenhage Div.; near Uitenhage, *Prior*.

This variety differs from typical *C. scabrida*, which is only known from a single gathering, much as *C. tetragona*, var. *linearis*, E. Mey., differs from *C. tetragona*, Linn. f., and much as *C. tabularis*, var. *confusa*, differs from *C. tabularis*, Page.

969. **Chironia (Ixochiron) tabularis**, *Page*, Prodr. 121 [Gentianaceae-Chironieae]; Steud. Nomencl. Bot. Ed. 2, i. 352. *C. jasminoides*, Edw. Bot. Reg. iii. t. 197; E. Mey. Comm. Pl. Afr. Austr. 179; Schoch in Bot. Centralbl. Beih. xiv. 194 partim; nec Linn., vix Griseb. *C. tetragona*, Schoch in Bot. Centralbl. Beih. xiv. 196 quoad syn. Edw. Bot. Reg. tantum; nec Linn. f. *C. tetragona*, var. *brevifolia*, Griseb. in DC. Prodr. ix. 40, quoad syn. Edw. Bot. Reg. tantum; nec Griseb. in Gen. et Sp. Gent. *C. tetragona*, var. *ovata*, Schoch in Bot. Centralbl. Beih. xiv. 197, partim et quoad 9614 Schlechter tantum; nec E. Mey.

Var. **confusa**, *Prain*; varietas caulibus 30–45 cm., nec 15–25 cm. tantum altis, foliis anguste ovato-lanceolatis linearibusve 2·5–3 cm. longis 2–4 mm. latis, nec ovatis ellipticisve 1·25–2 cm. longis 6–8 mm. latis, calycisque lobis angustioribus a *C. tabulari*, Page, typica recedens. *C. jasminoides*, Cham. in Linnaea vi. 344, quoad specimina e Caledon allata tantum; Griseb. in Gen. & Sp. Gent. 101 et in DC. Prodr. ix. 40 quoad descriptionem; Knobl. in Bot. Centralbl. lx. 328; Gilg. in Engl. Nat. Pflanzenf. iv. 2, 78; Schoch in Bot. Centralbl. Beih. xiv. 194, partim; nec Linn. *C. tetragona*, var. *linearis*, Schoch in Bot. Centralbl. Beih. xiv. 197 quoad 4182 Bolus tantum; nec E. Mey.

S. Africa. Without locality; *Drège*; *Hesse*; *Zeyher*; *Lehmann*; *Thom*, 808; *Ludwig*; also *cultivated specimens*. Cape Colony: Caledon Div.; mountains near Greitjes Gat, 1,600 ft., *Bolus*, 4,182; Houw Hoek, 1,800 ft., *Ecklon*; *Schlechter*, 9,393; near Genadendal, *Prior*; *Pappe*; Zwart Berg, *Pappe*; Bavians Kloof, near Genadendal, *Ecklon*; *Gibbs* (Herb. Bolus, 10,036); between Caledon and Pot River, *Ecklon*.

In addition to the cultivated specimens of the typical plant, which was at first erroneously referred in English gardens to *C. jasminoides*, and was subsequently named by Page *C. tabularis*, there are specimens in various herbaria from the following localities:— Stellenbosch Div.; Lowrys Pass, 1,000–2,000 ft., *Drège*. Bredasdorf Div.; hills near Elim, *Bolus*, 8,578; Koude River, *Schlechter*, 9,164. Swellendam Div.; in salt marshes, *Bowie*.

The true *C. jasminoides*, Linn., of which *C. lychnoides*, Berg., and *C. nudicaulis*, Linn. f., are no more than varieties, is a member of the section *Hippochiron*. There would appear to have been no

dubiety with regard to the identity of the species until the appearance of Thunberg's account of the genus (Trans. Linn. Soc. vol. vii.). The description given by Thunberg does not apply to the Linnean plant; the specimens in Thunberg's herbarium, which, through the courtesy of Professor Juel, we have had an opportunity of examining, show that the species to which Thunberg intended to apply the name is *C. melampyrifolia*, though with this he mixed a form of typical *C. tetragona* and, to a greater extent, *C. tetragona* var. *linearis*, E. Mey., giving an example of the latter to the younger Linnaeus, which is now in the Linnean Herbarium. Grisebach has in part followed Thunberg, since his *C. jasminoides typica* includes *C. melampyrifolia*, though the plant mainly intended by him is *C. tabularis*, var. *confusa*, which was first included in *C. jasminoides* by Chamisso. Edwards, or Ker-Gawler, in the Botanical Register and E. Meyer have, on the other hand, applied the name *C. jasminoides* to the plant which Page, almost simultaneously with the appearance of the description in the Botanical Register, treated as a distinct species, *C. tabularis*.

C. melampyrifolia, Lamk., has been similarly misunderstood. Thanks to the courtesy of Prof. Lecomte, we have been able to ascertain that *C. melampyrifolia* is the plant which in the first instance Lamarck tentatively referred to *C. lychnoides* (Encyc. Meth. i. 736), but which, on his discovery that it was not that species, Lamarck distinguished as a new species (Ill. Gen. i. 479). The name given by Lamarck was applied by E. Meyer, who in this has been recently followed by Schoch, to the plant that has since been described as *C. laxa*, Gilg. Lamarck's original type, however, makes it clear that *C. melampyrifolia*, Lamk., is in reality the species subsequently taken by Thunberg for *C. jasminoides*, Linn., and still later described in turn by Ecklon as *C. perfoliata*, by E. Meyer as *C. speciosa*, and by Paxton as *C. glutinosa*.

970. **Dorstenia (Eudorstenia) Smythei**, *Sprague* [Urticaceae-Moreae]; affinis *D. altae*, Engl., a qua nervis lateralibus foliorum numerosioribus et receptaculis minoribus recedit.

Frutex 2–2·4 m. altus, ramulis gracilibus circiter 1·5 mm. diametro superne puberulis inferne glabrescentibus, novellis tantum pubescentibus, internodiis 2·5–3 cm. longis. *Folia* oblanceolato-vel obovato-oblonga, apice subabrupte longiuscule acuminata, obtusa vel subacuta, basi cuneata, 11–14 cm. longa, 3·3–5 cm. lata, superne leviter subundulato-dentata, supra sparse lepidota, nervo medio et lateralibus paullulo prominulis, subtus sparse puberula nervis satis prominentibus; nervi laterales utrinque 9–10; petioli puberuli, 0·5–1 cm. longi. *Stipulae* oblique ovato-oblongae, acutae, ciliolatae, extra sparse puberulae praecipue in nervo medio. *Receptacula* in axillis superioribus solitaria, in pedunculos puberulos circiter 11 mm. longos angustata, naviculiformia, bicrura, 1–2 cm. longa, cruribus 1·6–1·7 cm. longis rectis ascendentibus linearibus ab apice in basin leviter angustatis puberulis demptis, 4 mm. lata, medio 4 mm. alta, puberula, margine integro 0·75 mm. lato. *Flos femineus* in centro receptaculi solitarius, perigonio tubulari 0·75 mm. prominente extra valde papilloso. *Ovarium* oblongum, 2·5 mm. longum, stylo ei sub-

aequilongo, stigmatibus duobus revolutis. *Flores masculi* numerosi, diandri, perigonio bipartito extra valde papilloso.

SIERRA LEONE. *Smythe*, 237.

XLI.—CULTIVATION OF SISAL HEMP IN GERMAN EAST AFRICA.

The following article on the cultivation of Sisal hemp in German East Africa, which is an abstract from Dr. Stuhlmann's paper in *Der Pflanzer*, Nos. 15 and 16, September, 1907, pp. 229–243, appeared in the *East African Standard* for May 16, 1908 :—

In 1893 the German East Africa Company in East Usambara ordered 1,000 Sisal plants from Florida, but only 62 survived the journey. These were carefully tended in the plantation at Kikogwe, and new plants were propagated from them, so that in 1898 the number had increased to 63,000. In 1899 machinery was introduced for extracting the fibre. By the beginning of January, 1900, there were no less than 150,000 plants established, of which 4,000 were more than three years old and were ready for cutting. After it had been ascertained, by means of small samples sent for valuation, that the fibre was of good quality, the first consignment was made in 1900. The following are the amounts and values of the exports of Sisal hemp from Kikogwe during the years 1900 to 1906 :—

Year.	Amount.	Value.	Year.	Amount.	Value.
	Tons.	£		*Tons.*	£
1900	7½	155	1904	624	18,300
1901	45	1,300	1905	887	27,000
1902	177	5,445	1906	986	32,000
1903	347	9,860			

In 1894, out of a total of 1,800,000 plants, as many as 1,300,000 were ripe for cutting, and from these were obtained 624 tons of fibre ; hence the yield per plant was about 17 ozs. The same number of plants were cut in 1905, and yielded 887 tons, or about 25 ozs. per plant. In 1906 there were 1,600,000 plants fit to be cut, and these produced 986 tons of fibre, or about 22 ozs. per plant. From these figures it appears probable that each plant, after reaching the age at which leaves can be cut from it, will give an annual yield of 17 to 23 ounces of fibre, and that in a carefully-cultivated plantation about two-thirds of the total number of plants will be ready for cutting if replanting is carried out where necessary. From 1,000,000 plants, of which 666,000 can be cut annually, a crop of 333 to 433 tons of fibre may be anticipated. In order, however, that this yield may be maintained, it is

necessary that half-a-million new plants should be inserted between the old ones, as cutting can only be carried on for two or three years in German East Africa before the plant puts forth its inflorescence, or "pole." It is calculated that if 800 plants are planted per acre an annual crop of 900 to 1,200 lbs. per acre should be obtained. The results obtained at Kikogwe lend support to this estimate.

The following table gives interesting particulars as to the approximate number of Agave plants in the different districts of German East Africa at the beginning of 1907, and the proportion which were ready for cutting :—

District.	No. of Plantations.	No. of Plants.	No. of Plants ready for cutting.	Total Area planted.	Area occupied by Plants ready for cutting.
				Acres.	*Acres.*
Tanga	13	10,305,600	2,168,000	14,250	3,190
Wilhemstal ...	3	810,160	—	560	—
Pangani	2	3,330,000	2,200,000	5,000	3,500
Lindi	5	1,127,000	110,000	1,330	137
Total ...	23	15,572,760	4,478,000	21,140	6,827

In the Tanga district the low proportion of the plants which were ready for cutting is explained by the fact that at the time of making the estimate many of the recent plantings had not yet reached maturity.

The four districts mentioned above require a total number of daily workers of 8,500, or, allowing for absence from illness or other cause, a staff of at least 11,300 people. The workers are paid on the average 40 hellers per day.

The machine employed for Sisal hemp extraction in the larger undertakings in German East Africa is one which is used to some extent in Yucatan, Mexico, and is known as the "Molla" machine.

It costs about £650, is capable of treating from 85,000 to 120,000 leaves in ten hours, and needs about 48 h.p. to drive it. The bundles of leaves as brought in from the plantation are placed by one or two workers on a travelling lattice, which carries them to a table in front of the machine. Four men are then required to open the bundles and lay the leaves on the conveyor, which introduces them to two raspadors arranged at right angles to one another, where they are cleaned, one-half of the leaf being stripped at a time. The fibre on leaving the machine slides down on a wooden frame, and is then subjected to washing, women being employed for this work. In order to keep the machine sufficiently employed a plantation of at least 600,000 plants is requisite, which, allowing a space of 40 in. by 100 in. (about $3\frac{1}{2}$ ft by $8\frac{1}{2}$ ft.) for each plant, will cover an area of about 310 acres. Disadvantages possessed by this machine are the difficulty of replacing damaged parts, and the lack of durability of the bronze coating with which certain portions of the machine are provided.

The following are the approximate quantities and value of the Sisal hemp exported from German East Africa since 1902 :—

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	Tons.	£		*Tons.*	£
1903	422	16,000	1905	1,140	43,900
1904	765	28,300	1906	1,836	66,900

During the first half of 1907 the exports from Tanga and Pangani amounted to about 1,321 tons, of value £50,600.

XLII.—POLYADOA AND HOLALAFIA.

Otto Stapf.

Polyadoa.—In the *Journal of the Linnean Society* vol. xxx. (1894), p. 90, I described what was evidently a new species of *Apocynaceae* as " Apocynacea quoad genus dubia," from specimens collected by Mr. Scott-Elliot in Sierra Leone. In the absence of fruits I hesitated to refer it to one of the genera then known or to make a new genus of it. Subsequently, when working out the *Apocynaceae* for the *Flora of Tropical Africa*, I recognised it as congeneric with *Hunteria umbellata*, Hall. f. (*Carpodinus umbellata*, K. Schum.), and based a new genus, *Polyadoa*,* on those two species. The name (*Polyad-oa*) was intended to indicate one of the principal characters by which the new genus could be distinguished from *Hunteria* and *Pleiocarpa*, two genera with which it was evidently allied. Apart from the numerous ovules, I pointed to the terminal inflorescences, the coriaceous sepals, and intracalycular glands, as characters foreign to *Pleiocarpa*. The fruit of *Polyadoa* was still unknown, but its numerous ovules suggested to me a fruit quite different from that of the 1–4-ovulate fruits of either *Pleiocarpa* or *Hunteria*. From fruiting specimens of *Polyadoa umbellata* received last year from Mr. E. W. Foster, of Lagos, my assumption has been confirmed ; but at the same time it has become clear that *Polyadoa* should be reduced to *Picralima*, a genus proposed by Pierre in 1896. The floral characters are the same, excepting the very much larger size of the flowers of *Picralima Klaineana*—the type of the genus—whilst the fruit only differs in its dimensions and in the complete separation of the carpels from an early stage in *Polyadoa* against their partial coalescence in the flower of *Picralima Klaineana*.

The two species of *Polyadoa*, which have been described by me in the *Flora of Tropical Africa*, will therefore have to stand as species of *Picralima*, viz., *P. umbellata* and *P. Elliotii*. To these should be added another, imperfectly known, species from

* Stapf in Thiselton-Dyer, *Flora of Tropical Africa*, vol. iv., p. 103, and in *Hooker's Icones Plantarum*, t. 2762.

Liberia.* On the other hand, the generic affinity of my *Polyadoa* (?) *Simii*† is still very doubtful; it may after all be a *Pleiocarpa*.

Picralima comprises, therefore, at present, *P. Klaineana*, *P. umbellata*, *P. Elliotii*, and a fourth, species from Liberia.† *P. Klaineana* was recorded in the *Flora of Tropical Africa* from the Cameroons, Gaboon, and the Congo Free State. Specimens referable to this species have since been received at Kew from the Gold Coast (Johnson, 917) and Uganda (Dawe, 707, and 709), and considerably extend our knowledge of its area. The large flower, and, in the young state, semi-coalescent carpels, as well as the peculiar fruit, of the type of the genus, seemed to indicate a somewhat isolated position in *Plumerieae*; but with *P. umbellata* and *P. Elliotii* thrown into it the position of *Picralima* as an ally of *Hunteria* seems to be satisfactorily established.

The fruit of *P. umbellata* consists of two globose, yellow mericarps, very slightly flattened at the base where they meet, and supported by the small persistent calyx. They measure up to 3·5 cm. in diameter. The pericarp is fleshy, 4–6 mm. thick, traversed by scattered bast fibres and full of a latex, which, in specimens preserved in spirit, oozes out as a semi-liquid, gelatinous, colourless mass when the rind is pricked. The same substance also surrounds the 10–12 seeds, which are separated from each other by more or less perfect false septa. The seeds are compressed, broad-oblong, 14–16 mm. long and up to 8 mm. broad. The testa is sub-coriaceous, whitish, and conspicuously nerved, the nerves ascending obliquely and branching in the upper part. The endosperm is fleshy, and the embryo, which is about 8 mm. long, consists of two thin, foliaceous, ovate-elliptic cotyledons and a cylindric radicle of the same length as the cotyledons.

Holalafia.—Syncarpy in *Echitideae* is almost limited to a few Indo-Malayan genera, as *Vallaris*, *Lyonsia*, *Parsonsia*, and *Beaumontia*, and was not known to occur among the African members of that tribe until the discovery of *Holalafia*. This genus was described by me in the *Kew Bulletin* for 1894, p. 123, and subsequently figured in *Hooker's Icones Plantarum*, tab. 2350, from flowering specimens. In the Indo-Malayan syncarpous genera already mentioned this character applies to all species, and the genera themselves differ from the allied apocarpous genera in numerous other respects. It is otherwise in *Holalafia*. I have already pointed out (*Hook. Ic. Pl.*, tab. 2350) that *H. multiflora* corresponds nearly with *Alafia landolphioides* in the general facies and in the form of the inflorescence, and it was merely the apparently generic value of the principal distinctive character, the syncarpy of the ovary, which induced me to separate *Holalafia multiflora* generically from *Alafia*. Since then we have received, first through the kindness of Mr. P. H. Marsden, of Liverpool, and then from Mr. Pynaert, of Eala, in the Congo Free State, sufficient material to describe both the development of the fruit up to the dissemination of the seeds and the seeds themselves.

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* Stapf in Johnston, Liberia, p. 622.
† Stapf l.c. p. 624.

The carpels, which are completely consolidated in the flower, remain so until they have attained their final size, which may be as much as 1·5 m. in length and 2 cm. in diameter. They then begin to separate from the base upwards into two follicles, without, however, becoming detached from the torus, and at the same time they dehisce along their ventral sutures. For a long time the carpels remain connected near the apex, but little force is required to cause their complete separation. Most of the seeds probably escape whilst the long, pendulous fruits are in that condition. The structure of the seeds is exactly like that of *Alafia landolphioides*. At the time of the publication of the *Apocynaceae* of the *Flora of Tropical Africa* the embryo of *Alafia landolphiensis*, and, in fact, of *Alafia* generally, was unknown. Good seeds, however, have since been received from Southern Nigeria (Unwin, No. 7). The embryo is characterised by its bright green colour and by a longitudinal fold along the middle line of each side-half of the cotyledons, the margins standing out at almost a right angle to the fold. Exactly the same structure is found in the somewhat larger seed of *Holalafia multiflora*, with the exception that the margins of the cotyledons are doubled back on the fold. I may add that the seeds of only one other species of *Alafia* are known, viz., *A. lucida*, Stapf (Uganda, Whyte, without number). Here, too, the embryo is green, but the cotyledons are flat.

Holalafia, apart from the fruit character described, is thus practically nothing but a large-flowered *Alafia*, or in other words the peculiarity relied upon for its generic distinction is not correlated with any character alien to *Alafia*, and the generic distinction itself is hardly any longer justifiable. I would, in reducing *Holalafia multiflora* to *Alafia multiflora*, not even propose to retain it in a special sub-genus or section, so intimate appears to me its connection with *A. landolphioides* in the light of my present knowledge of those plants.

To complete the description of the seeds, I would add that they attain a length of 2–3 cm. and a width of about 3–4 mm., whilst their silky brown coma measures from 9 to 15 cm. in length.

De Wildeman figured an old, flattened-out follicle in his *Mission Emile Laurent*, tab. 144, and on p. 576 of the same work adds some localities not recorded so far for this species. They are all, with the exception of Kutu (south of Lake Léopold II.), near Coquilhatville, on the Congo River, and add nothing to the area indicated in the *Flora of Tropical Africa*.

XLIII.—MISCELLANEOUS NOTES.

Mr. William Fawcett, B.Sc., F.L.S., Director of Public Gardens and Plantations, Jamaica, and Mr. John H. Hart, F.L.S., Superintendent of the Botanic and Agricultural Department, Trinidad, have retired from their respective posts. Mr. Fawcett was appointed to the post which he has just vacated in December, 1886, and Mr. Hart took up his duties in Trinidad in March, 1887.

Raphionacme utilis.—In the *Kew Bulletin*, No. 5, 1908, pp. 209–215, an account was given of the new Ecanda rubber plant from Portuguese West Africa. Mr. John T. Norman, of the City Central Laboratory, 23, Leadenhall Street, E.C., who had also received some of the tuberous roots of *Raphionacme utilis*, and some of the "mutáres" (native rubber prepared from the roots) for investigation, has kindly forwarded the following report to Kew :—

"*The chemical composition of the tuberous roots of Raphionacme utilis and of native Ecanda rubber.*

"The roots were covered with a dry, brown, parchment-like skin, and in some cases were much shrunken and decomposed. On cutting the fresher roots, a white latex of pleasant odour freely exuded, whilst on tearing apart those which had decomposed, threads of a substance resembling caoutchouc were observed.

"The 'mutáres' were grey irregular lumps, roughly finger-shaped ; they possessed an earthy and somewhat musty odour, but although obviously contaminated with soil and fibrous matter, they exhibited considerable resiliency.

"*Analysis of the Mutáres.*

"Caoutchouc	80·4
Resin, &c., by alcoholic extraction	6·4
Moisture or matters volatile at 100° C. ...	1·6
Mineral matters	4·4
Fibre and matters soluble in water	7·2
	100·0

"The caoutchouc was obtained from the residue after extraction by absolute alcohol and water ; it was dissolved in toluene, the solution filtered and the filtrate precipitated by alcohol. Since this method proved troublesome when working quantitatively, owing to the swelling of the mass and the great difficulty of removing the last trace of solvent, the estimation of the caoutchouc was eventually effected by dissolving the 'mutáres' rubber in carbon tetrachloride, and then forming the tetrabromide, which is a white powder equivalent to 0·298 of its weight of caoutchouc.

"*Analysis of the tuberous roots.*

"Caoutchouc	0·77
Resin, &c., by alcoholic extraction	1·91
Dried extracted residue	7·16
Water and water soluble substances	90·16
	100·00

"In this analysis the root was dried at 100° C., and then extracted with absolute alcohol, water, carbon tetrachloride, and the extract finally treated with acetone to precipitate the caoutchouc.

"The root, in another experiment, was pulped, and allowed to soak in water with the addition of a little ammonia; the liquor was then strained off from the pulp and heated with sodium sulphate and a trace of sulphuric acid in order to coagulate the latex: the coagulated latex or caoutchouc was recovered. The fibrous fleshy residue or pulp was separately extracted with carbon tetrachloride, filtered, and the caoutchouc precipitated from the filtrate with acetone. This treatment yielded a total percentage of caoutchouc amounting to 0·95.

"A few of the 'mutáres' were sent to a rubber factory, where they were treated as ordinary crude rubber, cleansed and worked into sheet form. Some of this cleansed rubber was vulcanised, and also mixed with surrogates, &c., with very satisfactory results, having regard to the small quantity available."

Two of the tubers sent to the Royal Botanic Gardens by the Companhia de Moçambique were handed to Mr. Boodle, who has examined them in the Jodrell laboratory, and reports on the yield of rubber as follows:—

"Two tubers of *Raphionacme* were handed to me for an experimental extraction of rubber, and yielded together 6·67 grm. of caoutchouc. When received, they had lost a certain amount of their water by slow evaporation, and, a few days before, they had been soaked for an hour or two in spirit. One tuber (*a*) was considerably shrunken and comparatively dry, while the other (*b*) was very wet inside, and consequently much the heavier, the respective weights being: (*a*) 29·69 grm.; (*b*) 78·42 grm.

"After weighing, the tubers were cut up into small pieces, soaked for a day in strong spirit, then dried in the sun, and weighed. The rubber was extracted in carbon bisulphide, and either precipitated in spirit, or obtained by evaporating off most of the solvent and then treating with spirit. Five extractions of rubber were made in the case of one tuber, six in the other, and, judging by the yield of the last extraction, the unextracted remnant must have been very small.

"The weights of the dried tubers and of the yield of rubber are given below:—

——	Tuber (*a*).	Tuber (*b*).
Weight of tuber directly after drying ...	16·75 grm.	17·32 grm.
Weight of rubber extracted	3·76 „	2·91 „
Percentage of rubber to dry-weight* ...	22·4 per cent.	16·8 per cent.
Percentage of rubber to dry-weight for the two tubers	19·6 per cent.	

* Here "dry-weight" signifies the weight of the tuber sun-dried after soaking in spirit, *i.e.*, after the extraction of the greater part of the resin and other substances soluble in spirit.

"These figures are not strictly comparable with those given by Mr. J. T. Norman in his analysis, but it will be seen that the percentage of rubber to dry-weight in the two tubers, dealt with

in this note, is considerably higher than that obtained by Mr. Norman, being 19·6 for the two tubers (*see* above), and only 10·7 (*i.e.*, 0·77 caoutchouc to 7·16 dried extracted residue) in the tuber analysed by Mr. Norman. For this comparison the dried extracted residue is treated as though equivalent to the dried tubers (*a* and *b*). The latter, however, must have contained some substances soluble in water, and traces of moisture and resin, so that their weight reads a little too high, and the percentage of caoutchouc too low. The difference between the two percentages should therefore be somewhat greater than the figures show."

L. A. B.

Romulea as a Pest in Australia.—In the *Agricultural Gazette of New South Wales*, xii., 1902, pp. 232–236, an account has been given by Mr. R. Helms of the occurrence of "*Romulea rosea*" as a weed, said to have been introduced into Australia from South Africa more than 60 years previously. Since the publication of this paper, specimens of the plant have been sent to Kew for determination, as doubts have arisen as to its identity. It has been proclaimed under the Thistle Act as a noxious weed under the name of *Romulea cruciata*.

The following letter has been received at Kew on the subject of this plant from Mr. James Tovey, Viola, Como Parade, Mentone, Victoria :—

May 4, 1908.

"I have to thank you for your kindness in naming the *Romulea* for me. If I am not trespassing too much on your valuable time I would like a little information on the following :—

"Is *Romulea cruciata*, Ker-Gawl, considered at Kew to be a synonym of *R. rosea*, Eckl. ?

"I find that after having examined several score of flowers of this introduced Irid, that the style is always shorter than stamens, whereas the style of *R. rosea*, Eckl., is longer than the stamens. Would not the fact of the style being always shorter than the stamens and smaller flowers distinguish it from *R. rosea* and bring it under *R. cruciata* ?

"If *R. cruciata* is a good species ?

"The reason I am troubling you so much on the subject is that this Irid has spread over a large portion of this State and has become a perfect pest, and has even been proclaimed under the Thistle Act as a noxious weed, under the name *Romulea cruciata*, Ker-Gawl. And as there is great confusion here over its identification, I would be pleased if you could enlighten me further on the subject."

Romulea cruciata, Eckl., is known only from the figure of *Ixia cruciata* in Jacquin's Icones, ii. t. 290, which shows stout, petioled leaves, resembling in outline those of some species of *Babiana*, but in transverse section resembling a Maltese cross, the rays being of equal length. *Romulea cruciata*, Béguinot (Engl. Jahrb. xxxviii., 335), described as "foliis cylindrico-linearibus, valde

compressis," and its forma typica as "foliis latissimis . . . nervis debilis et parum prominentibus," is probably quite distinct from Jacquin's plant.

The two other species, which have been suggested for the Australian plant, are *R. rosea*, Eckl., and *R. Bulbocodium*, Seb. et Maur., the former being widely spread in South Africa, and the latter in the Mediterranean region. The leaf-sections of these two species and of the Australian plant are identical, and show the leaf to be twice as broad as thick, while the outline of the leaf is linear and quite unlike that of *R. cruciata*, Eckl. Hitherto *R. rosea* and *R. Bulbocodium* have been regarded as distinct species, chiefly on account of their widely-separated habitats; the only structural difference suggested being that the styles of the latter overtop the anthers to a greater degree than those of the former. In the Australian plant the styles are said to be shorter than the anthers. This cannot be regarded as a valid specific difference, for Battandier (Bull. Soc. Bot. France, xxx., 238) has shown that heterostyly exists in *R. Bulbocodium*, while Schonsboe (Gewächs. Marok. 13) in 1801 described three varieties from Marocco differing in size and colour of the flowers. *R. rosea*, Eckl., was founded upon *Ixia rosea*, Linn. Syst. ed. 12, 75, which in turn was described from *Bulbocodium pedunculis nudis unifloris* in Miller's Icones, 160, t. 240, in which the styles and stamens are similar to those of the Mediterranean plant. Ker-Gawler, in a note to Bot. Mag. t. 1225, after mentioning that a doubt has arisen whether "*Ixia Bulbocodium*" of Bot. Mag. t. 265 was drawn from South African or European material, states :—"It is, however, difficult, if not impossible, to give any sufficiently precise definition of the marks that distinguish the two species" [i.e. *rosea* and *Bulbocodium*]. It seems, then, reasonable to unite these two under the name of *R. Bulbocodium*, Seb. & Maur. Fl. Roman. 17 (1818), and to regard *R. rosea*, Eckl. Top. Verz. 19 (1827), as a synonym. *Trichonema cruciatum*, Ker-Gawl. in Bot. Mag. t. 575, is a totally different plant from *Ixia cruciata*, Jacq., and has been called *Romulea longifolia*, Baker.

At Kew the following Australian specimens exist:—Western Australia: Guildford, near Perth, *C. Andrews*, 948; South Australia: Belair, *Max Koch*, 905; Victoria: around Melbourne, *McAlpine*, and Mentone, *Tovey*. Mr. Helms also records it from around Sydney, N.S.W., where the children eat the corms and seed-capsules, which they call "yams" and "puddings" respectively. From it having first attracted attention at Guildford it has been called "Guildford Grass"; it is also known as "Onion Weed."

Analysis has shown that the foliage is not nutritious. The very large amount of sclerenchyma in the leaves makes them very tough and indigestible, and if they were longer would prove a source of useful fibre. The leaves are not touched by horses and cattle except in times of scarcity of other food. The indigestible parts collect into balls in the animals' stomachs, and have been known to cause death. The corms, on the contrary, are highly nutritious, and have been found to contain 75·3 per cent. of starch in the dry substance—a greater percentage than in the potato.

The plant propagates itself very rapidly by means of both corms and seeds. Various methods have been suggested for eradicating this weed, but the only certain one is to dig up and destroy the corms as soon as the plant is observed, and so prevent it spreading.

C.H.W.

Presentations.—GARDENS.—A pair of Egyptian Geese, presented by Mrs. Bolas, 60, Grove Park Terrace, Chiswick.

MUSEUMS.—Three pieces of old Oak logs, in good preservation, from beneath the tower of Holy Trinity Church, Hull. A.D. 1300. Presented by Mr. Francis Fox, C.E.

Fruits of *Canarium Schweinfurthii*, seeds of *Phaseolus lunatus*, a sample of African Kino (*Pterocarpus erinaceus*) and leaves of "Otokobakar" (*Bauhinia reticulata*); an infusion of the latter, prepared by boiling, is used to coagulate the latex of the "Ire" or Silk Rubber Tree (*Funtumia elastica*). From Mr. A. E. Evans, Curator, Botanic Station, Aburi, Gold Coast.

Cotton Pods, San Bartoleme, Chiapas, Mexico. Received from Mr. J. W. Brenchley.

Three portraits of William McNab, A.L.S. Presented by Prof. Bayley Balfour, F.R.S.

Twenty-six photographs of leaves and cones of *Coniferae* grown at Bayfordbury, Herts. Presented by Mr. H. Clinton Baker.

Fig (*Ficus Carica*) with caprification fly from Smyrna. Received from Mr. G. Henderson.

Fruits of a species of *Vitex* near *V. heterophylla* from Foochow, China. The seeds are known as "Chan-ngai-long" and an infusion of the root is used to control suppuration, healing ulcers with marvellous rapidity. From Brigade Surgeon T. Burton Brown, C.I.E.

1. Marmozet Cage made of split cane, undetermined, Bahia. 2. Calf's Muzzle ("huilal") made of a rush (*Juncus procerus*, Mey. ?) by the Araucanian Indians, Temuco, Chile. 3. Bowl ("rali") made of the wood of *Laurelia aromatica* by the Araucanian Indians of South Chile and used for domestic purposes. Presented by Mr. R. Morton Middleton, F.L.S.

Panama Hat from Guayaquil, Ecuador. Presented by the Assistant Director.

Samples of Gutta Gerip from *Willughbeia firma*. From Pulau Jerajah, Leper Island, near Penang. Reported upon by Messrs. Lewis and Peat, Mincing Lane, E.C. as follows :—

"The 'Biscuits' are very dark and rough, but fairly strong and in good condition, worth about 3*s*. per lb."

"The nuggets are clean and in good condition, but cut wet and very spongy, value about 1*s*. 9*d*. to 1*s*. 10*d*. per lb."

"The scrap is ordinary, black, ill-shapen lumps, also cutting spongy and wet and shewing a few pieces of bark and grit, worth about 1*s*. 6*d*. to 1*s*. 8*d*. per lb. The best form to send this rubber

in would be as 'Biscuits,' but a little more care should be taken in the preparation." Received from Mr. R. Derry, Assistant Superintendent, Botanic Gardens, Singapore.

Cocoanut Diseases.—Through the courtesy of the Secretary of State for the Colonies, a copy of a Memorandum on the "Cocoanut stem-bleeding disease" by Mr. Petch, the Government Mycologist of Ceylon, has been received at Kew. The fungus causing the disease has proved to be *Thielaviopsis ethaceticus*, Went, a well-known parasite of the sugar cane in Java, Mauritius, and the West Indies. The treatment which is being adopted to combat the disease and which appears to be successful, consists in cutting out and burning all diseased tissue; the wound is then scorched with a torch of rags dipped in oil or by some other means and finally covered with hot coal tar. On large estates, young trees are being sprayed with Bordeaux mixture to avoid infection.

From the Government of Madras a report, No. 786, 15th March, 1908, on the "Cocoanut Palm Disease in Travancore," by Dr. Butler, Imperial Mycologist, has been received.

This disease appears to be due to a species of *Botryodiplodia*, a species of which genus has caused a serious cocoanut disease in Trinidad.

The character of the disease and methods of prevention are discussed at length in the report.

In *The Agricultural News*, Vol. VII., No. 162, p. 219, this latter disease is also referred to. From the preliminary experiments of Mr. Stockdale, Mycologist to the Imperial Department of Agriculture, West Indies, with the species of *Botryodiplodia* found in Trinidad, and also in British Guiana, it seems likely that this fungus is a parasite, and that it may be able to infect the healthy roots of Cocoanut palms.

Pilocarpus racemosus.—Specimens in flower and fruit of this, the only West Indian species of *Pilocarpus*, have been received from Sir D. Morris, Commissioner, Imperial Department of Agriculture, West Indies. They were obtained from the northern part of Montserrat, by Mr. W. Robson, Curator of the Botanic Station, who reports having seen numerous plants of the species.

P. racemosus, Vahl, is a strong-smelling shrub or small tree, 6–16 feet high, with thinly coriaceous leaves which are either simple, or have three or five pinnately arranged leaflets. It is a native of Martinique, Dominica* (*Anderson*, in Herb. Kew; *De Ponthieu*, in Herb. Mus. Brit.), Guadeloupe, Montserrat, St. John, Vieques, Puerto Rico and Cuba, but is scarce or very rare in several of the recorded stations, and is poorly represented in herbaria. It was discovered and drawn by Plumier, who travelled in the West Indies during 1689–1697, and it appeared in his

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* Not previously recorded.

Catalogus Plantarum Americanarum, published in 1703, as *Euonymus latifolius racemosus fructu pentagono atropurpureo;* the figure and description were published in 1757 in his posthumous Plantarum Americanarum Fasciculi, p. 119, t. 127, edited by Burmann, who called it *Prunus floribus racemosis foliis ovatis obtusis.* In 1797 Vahl, who had received specimens collected at Montserrat by Dr. John Ryan, recognised that it belonged to an undescribed genus, to which he gave the name *Pilocarpus* (Eclogae Americanae, p. 29, t. 10).

Detailed synonymy of *P. racemosus* is given by Urban in Engl. Bot. Jahrb. vol. xxi., p. 553 (1896).

T. A. S.

Botanical Magazine for June.—The plants figured are *Pandanus Houlletii*, Carr., *Rhododendron micranthum*, Turcz., *Bulbophyllum fascinator*, Rolfe, *Chirita barbata*, Sprague, and *Genista glabrescens*, Briq., all of which are in cultivation at Kew. The *Pandanus* is a native of Singapore and was first introduced into cultivation in 1865. A male plant flowered in the Jardin des Plantes, Paris, in 1868. The plant now figured is also a male, and was received from the Botanic Gardens, Singapore, in 1905. *Rhododendron micranthum* is remarkable for the small size of its white flowers, which are only a quarter of an inch long. In this country, where it has been introduced from Central China by Messrs. James Veitch & Sons, it is proving quite hardy. The plant figured was grown in the garden of Mr. J. C. Williams, Caerhays Castle, Gorran, Cornwall. The *Bulbophyllum* is a native of Annam, where it was discovered by Mr. W. Micholitz, and sent by him to Messrs. Sander & Sons. It is remarkable in having the united lateral sepals prolonged into caudate appendages which are as much as seven inches long. *Chirita barbata* is a new name for a plant which has been in cultivation since 1895 under the name of *C. hamosa*, and as such is figured in the "Revue Horticole," 1895, fig. 161, and 1896, p. 184 (coloured plate). It is shown, however, that it differs from the true *C. hamosa*, R.Br., in the leaves, in the size and shape of the calyx, and in having very woolly, not glabrous, anthers. Mr. J. Sallier, of Neuilly, Seine, France, who first brought the plant into commerce, received it from the late Prof. H. Baillon, with the information that it had been introduced by means of seed from the "mountains of India." The *Genista*, a native of Central Europe, is one of the most attractive of the dwarfer species. It has been grown at Kew since 1896 when it was obtained from Mr. L. Späth, of Berlin.

Botanical Magazine for July.—The issue for this month comprises figures and descriptions of *Begonia cathayana*, Hemsl., *Coelogyne perakensis*, Rolfe, *Didymocarpus cyanea*, Ridl., *Olearia ramulosa*, Benth., var. *communis*, Benth., and *Rhododendron Mariesii*, Hemsl. and E. H. Wilson, all of which are in cultivation at Kew. The *Begonia* is a new species from Yunnan, where seeds of it were collected by Dr. A. Henry, and sent to Mr. A. K. Bully, of Neston, Cheshire, who raised a stock of plants which subsequently passed into the hands of Messrs. F. Sander and Son, to whom Kew

is indebted for the plant figured. It is an ornamental herbaceous species resembling *B. Bowringiana*, Champ. (B.M. t. 5182), and *B. laciniata*, Roxb. (B.M. t. 5021), and conspicuous by reason of its red stems and leaf-nerves, which are densely clothed with long crimson hairs. The flowers are vermilion, or salmon-coloured, $1\frac{1}{2}$–$1\frac{3}{4}$ in. across. *Coelogyne perakensis* is a new species which has hitherto been confused with another plant under the name of *C. sulphurea*, Reichb. f., a Javanese species of which there are living representatives at Kew. A specimen of the Perak plant (*C. perakensis*) was sent to Kew in 1903 from the Royal Botanic Garden, Glasnevin. The pretty *Didymocarpus*, with dark blue flowers, about $1\frac{1}{2}$ in. long, is a native of the Malay Peninsula, and seeds were first sent to Kew in 1902 by Mr. C. Curtis, at that time Assistant Superintendent of the Botanic Gardens, Penang. The plant has since been received from Professor Costantin, of the Jardin des Plantes, Paris. The elegant *Olearia* has been in cultivation at Kew for many years, its long graceful branches, bearing small leaves and numerous small white star-like flower heads, making it a plant valuable for greenhouse decoration. It is a native of Australia. *Rhododendron Mariesii* was first described in the *Kew Bulletin* last year. It belongs to the section *Azalea*, and resembles *R. rhombicum*, Mig. The Kew plants were raised from seed collected in Ichang, Central China, by Dr. A. Henry.

'Illipe' Nuts of Sarawak.—The following note on the 'Illipe' nuts of Sarawak appeared in the *British North Borneo Herald* of May 16, 1908, and appears to be of sufficient interest to warrant its re-production.

"For many years there has been exported from this country varying quantities of a valuable seed commonly spoken of as 'Illipe' nuts. The term 'Illipe' is ordinarily understood by botanists and interested commercial men to apply to a particular genus of Indian trees (*Bassia*) whose fruits provide several highly esteemed vegetable butters. It was suspected, however, that the so-called 'Illipe' nut of Sarawak would prove to be an entirely different fruit and such indeed we now know is actually the case: the fruit in question belongs to the order of Dipterocarps and the term 'Illipe' is erroneous. At the present time there are in the Kuching bazaar large quantities of this oily fruit destined for export. To Messrs. Chin Ann Bros. I am indebted for much information concerning these fruits and their origin: in their shop I saw three kinds of seed called Engkabang chantong, Engkabang Asu, and Engkabang changai, which in Singapore—according to Mr. Ridley—are known under the generic term of Sengkawang.

"*Engkabang chantong* (a Chinese perversion of jantong?) is the Engkabang 'par excellence,' having fruits much larger than either of the others and commanding a much higher price in the fat markets. When on the trees this fruit is provided with 5 (3 large and 2 small) leathery wings, giving it the appearance of a shuttlecock: in the market the wings are absent, being valueless—they are of some use to the species in promoting the distribution

of the seed by wind. The fruit itself is, roughly speaking, oval, in length about three inches; but in the bazaar it is difficult to find a whole specimen as the pericarp has been removed and the seed broken up. If this Engkabang seed be squeezed an oil oozes out; by merely indenting a seed with the finger nail this can be at once seen. The fat has recommended itself to natives of Sarawak —there are no religious objections to its use!—as of great value in cookery, and for this purpose large quantities of solid fat are extracted by a simple process of squeezing. The surplus seed is sold to the Chinaman, and in this bazaar the market price is five dollars per picul at the present time. Encouraged by such a high price, it has been planted extensively by certain enterprising Sea Dayaks of Saribas.

"Botanically the tree is a *Shorea* (*S. gysbertiana*, I believe*): it is common in lowland jungle, being particularly abundant in the districts of the Rejang, Lundu, Sadong, and Upper Sarawak.

"*Engkabang asu*—This is a smaller fruit, being not much more than an inch long. It also has five wings, the three larger ones reaching a length of six inches. The tree is common about Kuching and is known to Sea Dayaks as Engkabang rambai or buah lijan. It is another species of the genus *Shorea*.

"*Engkabang Changai* is still smaller and the fruit has five wings only about $\frac{3}{4}$ inch long. To Sea Dayaks it is known as Enteglam or Teglam, and I believe that this is also synonymous with Engkabang Tanggoi (Sea Dayak) and Engkabang terindak (Malay). To natives the oil of Teglam is perhaps the most esteemed of all, partly because it will keep for years in good condition. Botanically it is a Dipterocarp, apparently *Isoptera borneensis*.

"In the market these two latter kinds of Engkabang appear mixed up together and they sell for $2.80 per picul. The mixture comes from the Rejang district, Lundu, Upper Sarawak and Saribas.

"It seems quite possible that there is a great future for these fat producing Dipterocarps. The fat is apparently well suited for soap making, and at present the only objection to the Engkabangs as a source of vegetable fats for the European market lies in the fact that one can never be certain when the fruit season will appear. It is true that all the trees fruit at about the same time, but the period of fruiting may be at intervals of 5, 6, 7, or even 10 years. It is quite possible, however, that by cultivation and suitable selection a good strain could be produced which would solve this difficulty.

"We may mention that this class of tree, the Dipterocarps, has other good qualities to recommend it, *viz.*, the wood is often of excellent quality (*e.g.*, Engkabang pinang, Mahang besi and Loon); in some cases an oil (minyak kruing) is obtained by a very simple process from the trunk; and to this class belong the camphor and dammar producing trees. Finally, there are several other jungle

* [Under *S. gysbertiana* in the Herbarium, Kew, the following note occurs by Sir Hugh Low: "'Bunk Tansanang,' from this a useful oil is extracted." *See* also Low, *Sarawak*, pp. 46-47.]—Ed.

fruits utilised by natives as a source of cooking fat, and amongst these is one much sought for, the *katio* or *kachiau*. The tree producing this is a true *Bassia*, and is therefore entitled to the name of 'Illipe.' The oil is a pale yellow liquid with an odour like that of bitter almonds. From specimens supplied me by Mr. J. Baring Gould, a careful examination of this oil has been made recently by Mr. C. J. Brooks, of Bidi. Unfortunately it is not at present obtainable in great quantity, and it does not appear in the Kuching market; the tree is common in the jungle of the Saribas district, where the oil is well known."

Parkia Africana, *R. Br.* [*P. biglobosa*, Benth.]. **Leguminosae.**—A tree 40 to 50 feet high, native of tropical Africa. Pods and seeds of this tree have recently been received from Mr. C. W. Smythe, Agricultural Superintendent, Sierra Leone. The tree which is known under various names, viz., African Locust Kamdah, Oule or Houlle, Nitta, Nettie, Nutta, Arbre Sacre, Doura, &c., is chiefly valued for the mealy pulp in which the seeds are embedded.

This is used by the natives as food and for the preparation of a beverage, the seeds being torrefied and used as coffee or chocolate. In the Soudan the natives roast the seeds and after bruising them allow them to ferment in water until they become putrid when they are carefully washed, pounded into powder and made into cakes which are described as excellent seasoning for all kinds of food, though they have an unpleasant smell.

The leaves and roots are employed in medicine on the Gambia, being beaten up with water and applied as a remedy for sore eyes.

The following observations and analysis of the fruit pulp are gathered from the *Comptes Rendus*, CXLVI. No. 4, Jan. 27, 1908, 187.

The flour of Netté, Nété or Néré produced by the fruit of *Parkia biglobosa*, Benth., has been described by travellers as a food much appreciated by the natives of tropical Africa. It is, however, incorrectly named flour, as it contains no starch, but must be considered as a pulp which is formed during the ripening of the pod and in which the seeds are embedded. Other genera of the same family, *e.g.*, *Cassia* and *Tamarindus* have fruit of similar appearance but in these the pulp is compact and fleshy, whilst in *Parkia* it is dry and friable at maturity.

An analysis of the pulp gave the following composition :—

	Per cent.
Water	4·90
Ash	4·96
Phosphates	0·383 (as P^2O^5).
Total Nitrogen	0·624
Substances soluble in carbon bisulphide	1·30
„ „ alcohol	56·67
„ „ water	72·00

Full details of the analysis are given in the paper which are not reproduced here.

The importance of the examination is that it shows the truly nutritive value of this pulp which is fairly rich in fatty matters, in phosphates, and especially in sugars. Attention, however, should be drawn to a fact worthy of notice that this substance is the richest known of in saccharose, the pulp of the beet-root only contains as a maximum 18 to 20 per cent. of saccharose, the sugar-cane has a percentage on the average equal to beet-root, while in the Netté flour the figure rises to more than 25 per cent., and it may, perhaps, be much higher in the freshly collected flour. If the flour or pulp of Netté can be produced in considerable quantities in Western Africa this product could be applied to various industrial purposes.

J. M. H

Para Rubber at Tenom.—The following report on the yield of rubber from Para Rubber trees in the Government Garden at Tenom, British North Borneo, was compiled by Mr. F. E. Lease, Manager of Sapong Estate, and appeared in the issue of the *British North Borneo Herald*, for June 16, 1908.

The trees in question have been grown from seeds received at Tenom some seven or eight years ago. The seeds were received without any advice and their nature was unknown, but they were planted out in a nursery bed and in due time some were transplanted into the gardens, but a large number were left in the nursery bed where they may still be seen growing in a large clump surrounded by their own seedlings.

It was not until the rubber boon reached Borneo a few years since that they were recognized as Para rubber.

As other plantations are being formed in Borneo, reliable statistics as to the growth, progress and latex-producing qualities of Para Rubber trees under known climatic conditions should be of great value.

"The yield of one and three quarter pounds of rubber per tree in 12 months' tapping of trees between 5 and 6½ years old (at the termination of these experiments) is extremely satisfactory and so is the work of the tapping coolie who took on an average 16 cuts to remove one inch of bark: most of this tapping was done with an ordinary farrier's knife and some with a "safety" tapping knife, both simple instruments devoid of adjusting apparatus and so "fool proof."

"The trees were tapped every alternate day for one year without any rest except on such days as rain fell or the tapper was sick: they seem none the worse for this treatment and have yielded 20,849 seed as against 11,591 the previous year.

"Seed is harvested at Tenom from August to November and if the weather is favourable, again in January and February.

"In connection with the question of seed I might here mention as a matter of interest that a tree on Sapong Estate has flowered when just 20 months old.

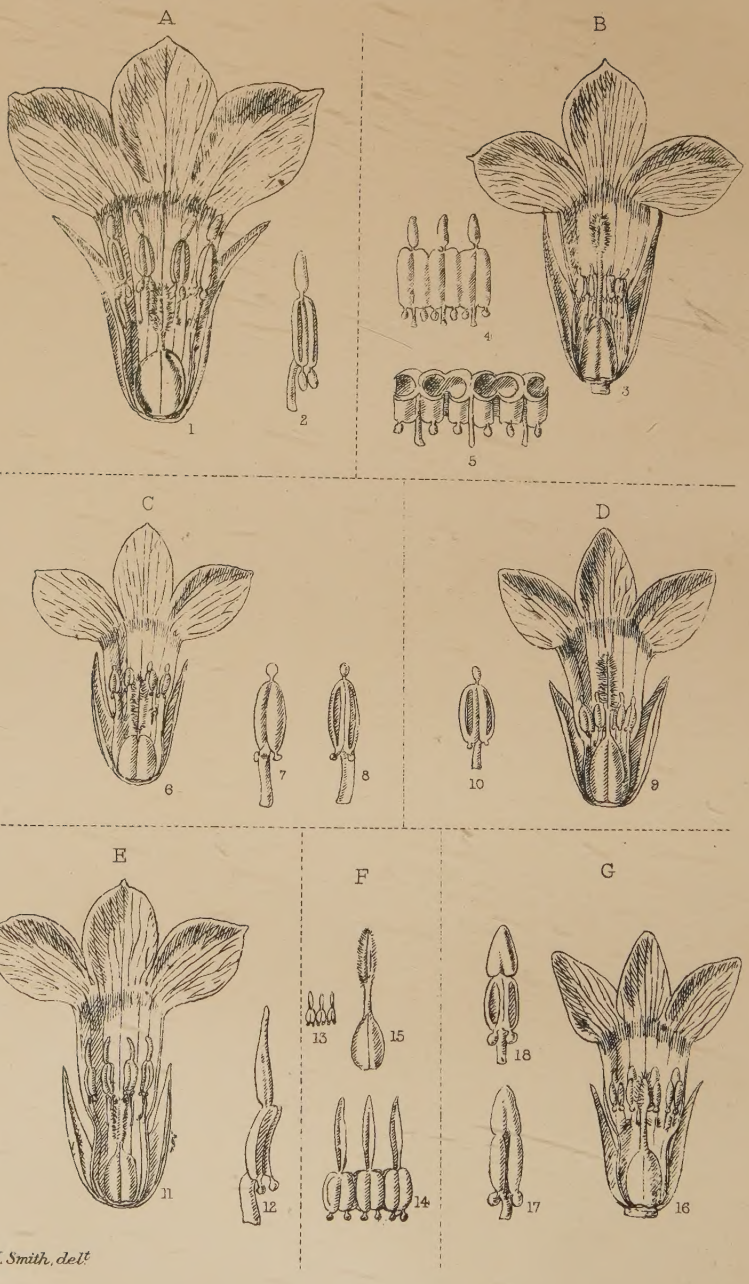
"Wounds from the "Y" tapping seem to heal much more quickly and evenly than those from "half herring bone" (all were done by the same coolie) probably the extra irritation from the three cuts of the latter prevented the regular healing of the wounds.

"There is practically no difference in yield per tree by either method of tapping but the "half herring bone" system has required the excision of 189 square inches of cortex for each pound of dry rubber obtained whereas the "Y" system only requires the excision of 147 square inches to obtain the same amount.

"This year's experiment will be the comparison of 50 trees tapped on the "Y" system against 50 trees tapped on "┐" system.

"One hundred and fifty five (155) Para rubber trees in Government experimental Gardens at Tenom were planted, not before December, 1900 nor after July, 1902 (exact date is uncertain as no records were kept). The plants have been uncared for and allowed to grow as they liked with the result that one quarter of them have two or three stems; this lowers considerably the average girth as in these calculations each separate stem is regarded as a separate tree: even then we get an average girth at five to six and a half years old of twenty-one inches at three feet from the ground, and the average increase in the girth during the last twelve months (ending 31st July, 1907) is four and three-quarter inches (Singapore Botanic Garden records an average of $3\frac{1}{2}$ inches).

No. of trees tapped.	Average girth at three feet from ground.	Method of tapping.	How often tapped.	Yield of dry rubber in 12 months.	Pounds per tree per annum.	Average square inches excised.		1 lb. of rubber requires excision of square inches of cortex.	Pounds per tree per tapping.	No. of tappings in 12 months.	Total square inches excised.	Thickness of each excision.
						Per tree.	Per tree per tapping.					
30	24 in.	Y	Every alternate day for 12 months.	$53\frac{1}{2}$ lbs.	$1\frac{3}{4}$ lbs.	287·4	1·64	147	0·011	159	7,834	$\frac{1}{15}$ in.
30	$21\frac{1}{2}$ in.	Half herring bone.		$53\frac{1}{2}$ lbs.	$1\frac{3}{4}$ lbs.	338·1	2·14	189	0·0113	158	10,141	$\frac{1}{16}$ in.



M. Smith, del.

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